The Builder.

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On Structural Proportion in Nature and Art.

THE *Journal of Hellenic Studies* for October last contains an article by Professor Michaelis of Strasburg, who has already explored so assiduously the private collections of ancient art in England, upon a remarkable basso-relievo among the Arundel collection at Oxford. It is illustrated by an excellent plate, after a photograph, and is replete with proofs of the learning and the labour which the author has always at command for a worthy subject. The slab is in the form of a pediment, but with the narrow angles cut off by a vertical line, and bounded on all sides and horizontally by a narrow projecting border. The surface is occupied by the figure of a man, somewhat above life-size, in relief, with arms extended and open palms. The head, shown in profile, reaches to the central angle, and the figure is cut off a little below the line of the nipples by the horizontal cornice. The features are battered; but the arms, though in low relief, are boldly modelled, and exhibit distinguished mastery of outline. In the field, as it may be called, above the right arm, is the outline of the sole of a foot, formed by a shallow scraped line, which shows distinctly the contour of the toes. Fortunately this has not suffered so much, scratched and rubbed as it is, as to frustrate the recovery of its exact dimensions.

This sculpture is of interest from three points of view,—on all of which the Professor disserts with true German elaboration. As a specimen of ancient sculpture it invites consideration as to its period and its style; it then appears to supply authentic original evidence on matters metrological,—the standard foot of the sculptor's nation,—and lastly, what we are now chiefly concerned with, we appear to have before us a visible memorial of the modulus of the artist as applied to the proportions of the human figure.

Those who are acquainted with the present German school of archæological research and criticism will be quite prepared to find that little difficulty is made of assigning the work to a particular half-century by indications of style; and that a hankering is even indicated for narrowing the limitation within a precise decennium. We may pass over this discussion, contenting ourselves with the remark that if there were no other reason for disallowing an Attic origin for the monument, we should decline to give weight to the argument that "an Attic artist would certainly have raised from the ground all the outlines rather strongly with a sharp edge, and would have represented the muscles of the arms with more subdued modelling." This seems to be an inference from some characteristics of the frieze of the Parthenon,—a work executed for an exceptional position; but even there, if the critic will look again, he will find that not "all the outlines" were so treated, and a little further observation will reveal a reason for the variation of method.

Again, only a few sentences can be spared for the very acute and learned, but nevertheless slightly perplexing, metrological analysis.

The best measurement that can be made of the footsole gives it as 0·296 m., which coincides with the Roman *pes monetalis*, and differs by ·012 m., or more than the eighth of an inch, from what has been the very generally accepted Attic foot, 0·308 m. But we are not allowed by the Professor to assume that we have before us a work executed in Greece when under Roman domination. We are called upon to accept 0·296 as the true measure of the Attic foot which became the model for the Roman. Be it so; but it is then pointed out that this foot is exactly one-seventh of the breadth given by the extended arms of the sculpture, from finger-tip to finger-tip, and an anomaly declares itself in consequence, which is frankly recognised. This extent is called a fathom; but the Attic foot which is represented by the sculpture, was reckoned by the current standard, the sixth of a fathom, not the seventh. The Egyptians, however, we are reminded, had two fathoms, of which the longer, the royal fathom, just meets the case: assume that it was this which Herodotus said coincided with the Samian fathom, and the difficulty may be surmounted by the further assumption that the monument is to be referred to Samos; we are then, it is true, face to face with the incongruity of the association of an Egyptian or Samian fathom with an incommensurate Attic foot; but the learned author is equal to the occasion, and meets this new difficulty, better or worse, by the conjecture that "possibly the conditions of international commerce at Samos were such as to require an indication of a double system," &c. "The addition of the Attic standard measure would then be far from startling. Possibly this addition was only made after Samos had passed entirely into the dominion of victorious Athens," and so forth.

But all this ingeniously-buttressed superstructure rests precariously upon the assumption that the full extent of the expanded arms of the sculptured figure must necessarily represent a definite measure of a fathom, the accepted equivalent of the height of a well-grown and developed man. But it is clear that the figure represents the proportions of the human figure upon, not a natural but an enhanced scale,—a scale which gives a stature of the excessive height of seven standard Greek feet.

The most certain fact in the case is an intention to exhibit the proportion of the length of foot of a well-made man to the extent of his expanded arms and hands, as one-seventh; and doubtless with reference to the common and notorious experience that this extent was equal to his full stature. But a pure exhibition of proportion is independent of the natural scale; the sculptor might have taken any stature at choice or at random. He chose to take, not the length of an actual human foot of a man 6 ft. high at the utmost, but the reputed foot,—the standard Attic foot measure as a modulus,—conceding, for argument sake, that the foot measure, 0·296 m. is the true Attic. This decision fixed him with a representative figure beyond the ordinary life-size; in fact, of an implied height of 2·070 m., instead of about 1·750 m.,—that is, of 7 ft. instead of 6 ft., and consequently a breadth for the expanded arms of his monument which by the same difference exceeded that of the average or ordinary man. Had the sculptor adhered to Xenophon's definition of the fathom, the extent within reach of the extended arms of an ordinary man, he must have given up the Attic foot, whether ·308 m. or ·296 m., as a modulus, and engraved a shorter foot-sole,—a foot-sole not exceeding 1·75÷7=) ·250 instead of ·296.

Assuming, then, that the expanded arms are to be taken as index of stature, we find that the length of one-seventh of this given to the foot is in accordance with the rule laid down by Leonardo da Vinci, but not specified by Vitruvius in his well-known canon.

The Vitruvian rule of making the hand, measured from wrist to tip of middle finger, one-tenth of the stature, is borne out very closely by the marble; and so also is the rule of one-tenth for the face from the chin to the roots of the hair above the forehead.

The record of Vitruvius again gives the height of the head from the crown to the chin as one-eighth of the stature, and the monument approaches this as nearly as 0·255 in. to the required 0·259.

A number of other precisely-adjusted proportions may be detected in this interesting

effigy, but enough have been noted for the purpose at present in hand. It will be observed that in these proportions as derived and copied from Nature's own handiwork, the dimensions brought into comparison are not reducible to terms of a single uniform modulus. Dimensions which compare variously in terms of different prime numbers, 2, 3, 5, 7, &c., defy reduction to a common unit of moderate subdivision. It is this difficulty which occurs in tuning musical instruments of fixed notes, and which is met or modified by the contrivance of equal temperament. The equivalent of this in architecture is the regulation of dimensions by subdivisions of a fixed modulus; this is very largely favoured by Vitruvius, but it is observable that he still preserves traces of the more scientific system of regulation by direct proportion. Modern examination has gone far to prove that this system was practised exclusively in the best Athenian age.

Of course there is no record to inform us how early the Greeks, in their devoted admiration for the human figure, began to recognise exact numerical standards of proportion for its most perfect development; but that it was at a very early age can scarcely be doubted. The conditions of health, activity, and athletic vigour occupied their attention from the earliest times of which we have historical record; and incomplete and fragmentary as are the remains of their early sculpture, an art which was steadily progressive through centuries, they are sufficient to indicate a sustained endeavour to approach nearer and nearer to distinct typical forms of which the characters were directly dependent on proportion. That the arts of sculpture and architecture should have been in course of development and intimate connexion together, through a long series of years, without mutual reactions, is not to be supposed; it were vain to speculate which of the pair was under greater obligation to the other. It is quite possible that the sculptor owed first to the architect his confirmed conviction of the value for artistic expression of exact and appropriately adjusted numerical proportion. However this may be, it most certainly appears, upon study of the finest productions of either art, that they held in common by the principle that an harmonious whole was not to be built up out of varied combinations of one uniform elementary dimension, or fixed invariable unit, but by varied proportionate subdivisions freely based upon the simplest of the prime numbers, 2, 3, 5, 7, more especially.

A notice remains of the principle which one ancient writer adopted and worked out in a lost treatise on the proportions of the human figure, which in itself has much to recommend it; he set forth that the proportion of every member, from the least to the larger, was adjusted to that with which it is in immediate organic relation. The finger has dimensions proportionate to the hand, the hand to the forearm, the forearm to the upper arm, the arm to the body, and so onward by a series of deductions and comparisons, which would lead ultimately to the estimate of full bulk and stature. This scheme is virtually implied in the proverbial phrase, *ex pede Herculem;* the foot of Hercules being given, the proportions o fthe hero at large are given. That the given foot would determine stature, within certain limits, is unquestionable; and it is also to be conceded that it would, within certain limits again, decide the character of the figure, —would give assurance of a frame as contrasted as possible to that of a Ganymede or an Apollo. But still, apart from previous knowledge of the type, it would by no means suffice for the recovery of the sculptor's ideal. The tracery of a window, or even the fragment of a moulding, suffices for general conclusions as to the style and period of a ruined cathedral, but will go little way indeed towards enabling us to restore, with any completeness and precision, the lost glories of a vast original and complex structure. The creative impulse of true artistic design, as of natural organisation, enforces the subordination of parts to a whole, of the subsidiary as derived, to the superior as antecedent. In both cases what controls the number, the nature, the interdependence of component members and their proportionate adjustments, is the equivalent to a primary characteristic idea; it is therefore from this idea that the processes of invention and imagination are most safely understood to start, and analytical study is only complete when this generative thought is recovered. The human foot is doubtless most admirably subservient to the purposes of the general organisation, but, taken by itself, it might be studied for ever, and no process of deduction would derive from it a knowledge of the marvellous mechanism of the human hand with which it is so intimately associated. Few triumphs of sagacity are more surprising than that of Professor Owen, who by minute scrutiny of a single fossil bone sent to him from Australia, announced the former existence of a bird of proportions that to the uninstructed seemed inconceivable, until confirmed by subsequent transmission of more of the skeleton. But the divination was effected by quickness of observation, sagacity and study, co-operating with stored knowledge of other complete organisms. The bone, taken by itself, would no more reveal even to an Owen, or necessitate all the details of the organism, than a moulding from Glastonbury would give up to an Australian Fergusson the plan and elevation of a cathedral. It is, no doubt, true that invention and imagination the most emancipated, when exercised upon an architectural problem, cannot emancipate itself from relation to material conditions, and will be largely controlled, if not governed, by them. It may be allowed to the imagination of the poet to give a local habitation and a name to "airy nothing," but an architect cannot escape from having to take into account the cohesion, resistance, and equilibrium of wood and marble, of bricks and mortar, and must, perforce, submit to limitations of proportionate parts, of voids and solids, of spans and scantlings accordingly. But this does not deliver over the mastery of his art to the material it is employed upon.

He works in this respect on parallel lines with the creative energies of nature. The foot of the camel has relation in size, strength, and elasticity, to a sandy desert, and the hoof of a horse to springy turf. But in both cases these particular material conditions are quite insufficient to decide the general habits and capacities of the animals. They are, as they have to be, regulated and subjugated in a manner and to an extent which gives them their place in a series of correlative adjustments. It is only so that they display their proper significance and become instrumental in conciliating a variety of secondary purposes in furtherance of main and important ends. It is only when this conciliation is perfected in the completed work, an ultimate harmony of admirably correlated functions and services, be it the organised animal or the architectural structure, that the idea which has governed the regulating and subjugating process all through becomes apparent and obtains its full expression. The material conditions in each case set limits to what can be done with them, but cannot determine what shall be or what must be done. Hence it is, that if we hope to discover the secret of those proportionate adjustments which in either case hold a complex of details and members together in unity, we must consider the main purposes, and, therefore, the largest relations first, and descend from those to the subordinate. By starting from the stature of the man we may more safely deduce not only foot and hand, but the limbs and general proportions; even as the proportions of nave and choir will guide us most satisfactorily to the appropriate dimensions of aisles or entrance-porch, or the predetermined scale of reception-rooms will impose and govern the nature and distribution of offices.

In dealing with any practical problem whatever, the primary requirement is a well-studied and distinct conception of the end proposed,—the chief purpose which renders it necessary or worth while to entertain the problem at all, and then of all the indispensable accessory aids and completions of that purpose. When we further proceed to realise the conception, particular adjustments are necessarily influenced by the nature and limitations of the means and materials at command. But the managing and moulding power still resides in the intelligence, and intelligence works from the end in view to the means by which,—from the general to the particular,—from a purpose as a whole to the several secondary and inferior furtherances as parts. Such is the grand conception of Cuvier as it is of Aristotle, almost the first name of importance on such a subject, that we come to looking back through the centuries before Cuvier. It was propounded by Anaxagoras that man is the most intelligent of organised beings in consequence of having hands: nay, argues Aristotle, man has hands because he alone of animals is gifted with sufficient intelligence to make right and full use of them. To the like effect, when in his treatise on the Generation of Animals he disserts on the development of the embryo, he notices that nature manifests the most essential characteristics, first in decisive outline, and afterwards brings forward the subordinate completions, even as a painter, he says, first makes a general sketch, and settles the leading contours of his design to be completed afterwards by filling in details and finishing with colours.

It appears, then, that if we are to hope to attain to a thoroughly worthy and masterly conception of the principles of proportion in the human figure we must not be contented to rest in compiling a list of the proportions of particular members,—mere detached hints and notices which may have their use in keeping an artist clear of any very gross divergences from a normal standard: what is required is a comprehensive theory which shall embrace the entire system in a simple scheme, and a coherent unity from which subordinate proportions are developed in appropriate gradation. That a somewhat nearer approach to a solution of the problem than is provided by the systems most in vogue is not hopelessly unattainable, may be set forth in a future article. The theory of composition in all the arts is in closest relation to a theory of harmonious proportion, and if ever a clue to its true significance is to be grasped, it may be hoped for from the study of that work of nature of which Hamlet is only echoing Aristotle's reverential awe and admiration when he exclaims,—"What a piece of work is man! In form and moving how express and admirable!"

THE METROPOLITAN BOARD OF WORKS AND LONDON THEATRES.

STIMULATED to action by the destruction of the city of Chicago and the disastrous fire at the Brooklyn Theatre in 1876, a Select Committee of the House of Commons was appointed in the year 1877 to inquire into the constitution, efficiency, emoluments, and finances of the Metropolitan Fire Brigade, with a view to providing further security from loss of life and property from fire. This Committee, which was presided over by Sir Henry Selwin-Ibbetson, consisted of twenty-one members, and included Sir Andrew Lusk, Mr. Locke, and Mr. Ritchie as representing Metropolitan constituencies, and Sir James McGarel-Hogg, the chairman of the Metropolitan Board of Works.

The immediate object of the Committee was to inquire into the working of the Metropolitan Fire Brigade, but the scope of the inquiry was enlarged by an instruction, moved at the instance of Mr. Onslow, that the Committee should have power to take evidence and report, with special reference to better means of preventing loss of life and property from fire in theatres and other places of public amusement. This instruction led to the taking of a considerable amount of evidence with regard to the construction of theatres, the means then available for the extinction of fire and the preservation of life in theatres and music-halls, and resulted in an important amendment of the law as affecting these places.

The Committee received evidence as regards theatres, &c., from the then Lord Chamberlain

(the Marquis of Hertford), the permanent secretary of the Lord Chamberlain's department (Mr. S. Ponsonby-Fane), and the architect officially consulted by the Department (the late Mr. J. T. Robinson); Mr. J. F. Pownall, the chairman of the Middlesex magistrates; Mr. George Vulliamy, the Architect to the Metropolitan Board of Works; Captain Shaw; Mr. Edwin Chadwick, C.B.; Mr. F. C. Penrose, the Surveyor to St. Paul's Cathedral; Mr. C. J. Phipps, the architect of several of the London theatres; the proprietors or lessees of the Court Theatre, the Criterion Theatre, the Folly Theatre (now Toole's Theatre), the East London Theatre, the Pavilion Theatre, and the Gaiety Theatre; the proprietor of the Canterbury Music-hall; Mr. Maberley, the architect to Exeter Hall; and Mr. Mitchell, one of the Committee of Management of the Sacred Harmonic Society.

One of the most important witnesses examined by the Committee was the Hon. Spencer Ponsonby-Fane, the controller or permanent secretary of the Lord Chamberlain's department, who, in the course of his evidence, admitted that the control of the Lord Chamberlain over theatres was inefficient, and suggested that there should be a Government department to superintend all public buildings as regards their construction; that the Lord Chamberlain's licence should be preserved, but that the issue of such licence should be dependent upon the production of a certificate from the department that the building to be licensed was in a satisfactory condition. The censorship of the Lord Chamberlain over pieces to be performed, Mr. Ponsonby-Fane suggested, might be retained.

Speaking of the Opera Comique Theatre, Mr. Ponsonby-Fane, in the course of his evidence, characterised it as being "one of the most fortunately placed theatres in London," and explained that the tunnel under the street was made after the theatre had been built and had been opened to the public, and that the tunnel had been added by the permission of the Lord Chamberlain. "I must point out to the Committee," he concluded, probably anticipating objection, "that it is underground; that it is fire-proof; people might be drowned there, but certainly they could not be burned."

It was elicited from this witness that the Lord Chamberlain had no power to require structural alterations to be made to existing theatres, and that in fact the only means of reaching a manager who disregarded the Lord Chamberlain's recommendations was the withdrawal of his licence, and this, he considered, would be too great a punishment. "The Lord Chamberlain," he said, in reply to a question (No. 1,251), "has no staff of inspectors. I, as the permanent Secretary of the Department, look to it entirely, assisted by the Examiner of Plays, who is an officer of the department. We also employ from time to time the best surveyor we can find to accompany us in those inspections, but we cannot be always inspecting. The inspection takes place once a year, or at the request of any manager if he is going to make an alteration."

The Commtttee made a report, in which they stated that in their opinion the structural conditions and arrangements of places of public amusement requisite to meet the danger of fire or panic are mainly regulated by practical considerations, and can only be settled by experts. As a safeguard against fire from without, the Committee recommended that the building should be isolated, either by an intervening space or by a wall of proper strength and material. With regard to the interior, in addition to the necessity of substantial fireproof construction, four points appeared to the Committee especially to require attention, viz.:—(1) Subdivision of risk, by separating from each other the various parts of the buildings, rooms, and passages by fireproof partitions; (2) distribution of rooms, with a view to minimise the chance of a fire breaking out; for instance, no room should be constructed above the stage, nor should the carpenters' shop be allowed to be placed above the lights of the gallery; (3) facility of egress. The outlets should be numerous and separate; passages should widen outwards, and be large enough to contain a considerable proportion of the whole audience. In these passages no steps should be allowed, or other impediments likely, in case of pressure, to throw down persons or injure them. At the same time arrangements should be made to break the pressure by the interposition of barriers at intervals, or giving an angular direction to the passage; all doors should open outwards; (4) appliances for the extinction of fire. Hydrants in connexion with the mains, and provided with hose, should be placed round the building, and also carried within, capable of throwing a jet to any part of the interior.

The report, in conclusion, recommended that no new theatre or large music-hall in the metropolis should be finally licensed until it had been certified that in respect of *position* and structure, it satisfied all due requirements for the protection against danger from fire, and that the Metropolitan Board of Works should be the certifying authority.

The report also recommended that, with respect to existing theatres and halls, the Metropolitan Board should have power to call on the proprietor to remedy such structural defects as appear to the Board to be the cause of special danger, and to admit of being remedied by a moderate expenditure, option being allowed to the proprietor to refer the whole question to arbitration.

That, with a view to the prevention of danger from fire, the Lord Chamberlain and the justices should be authorised to make regulations as to the management of theatres and music-halls under their jurisdiction; that, for the purpose of ascertaining whether such regulations are complied with, provision should be made for the inspection of these buildings, and that any breach of the regulations should be punishable on summary prosecution.

It was further recommended that effect should be given by the Legislature to these recommendations.

In the session of 1877-8 a Bill was introduced into Parliament by the Metropolitan Board of Works, which became law as the Metropolitan Management and Building Acts Amendment Act, 1878 (41 & 42 Vict., ch. 32). By the 11th section of this Act the Board are empowered to require the proprietors of theatres and of certain music-halls in use at the time of the passing of the Act to remedy structural defects which may result in special danger to the public frequenting the same. The consent of the Lord Chamberlain in the case of theatres under his jurisdiction, and of the Home Secretary in the case of all other buildings, is necessary before any proceedings can be taken by the Board, and the defects must be such as can be remedied by a moderate expenditure. Music-halls containing a superficial area of less than 500 superficial feet for the accommodation of the public are exempt from the operation of the Act.

The penalty imposed by the Act for non-compliance with the Board's requirements is 50*l.*, and a further penalty of 5*l.* per day in case of the continuance of such default. Provision is made for an appeal, the matter in dispute being referred to an arbitrator appointed by the First Commissioner of Works.

The Board are further empowered by the 12th section to make regulations with regard to new theatres and such music-halls as are not exempted from the Act, with respect to the requirements necessary to protect the public from danger in the event of fire, and may alter or vary the same from time to time.

No new building can be opened or used as a place of public amusement'; that is to say, for the public performance of stage plays, or for "dancing, music, or other entertainment of the like kind" (these words being the form used in the Act of Geo. II.,—25th Geo. II., cap. 36), without a certificate from the Board that the building was on its completion in accordance with the Regulations made by the Board, so far as the same are applicable, and to the conditions (if any) annexed thereto.

In accordance with the provisions of this Act the Board, on the 2nd of May, 1879, drew up a series of regulations for the construction of theatres and music-halls. These regulations provide that previously to any house or other place of public resort being opened for public entertainment, notice shall be given to the Board, accompanied by drawings of the building, with a specification of the materials to be employed, and a statement as to the number of persons to be accommodated in the building. If the drawings are approved, a certificate is issued by the Board in respect of the building, on its completion in accordance with the drawings approved by the Board.

The regulations further require that every theatre shall have a proscenium wall of brick to separate the stage from the auditorium; that the staircases and the floors of the several passages, lobbies, corridors, and landings shall be constructed of fire-resisting materials; that the minimum width of all staircases and corridors shall be 4 ft. 6 in.; that a clear passage-way, not less than 3 ft. wide, shall be reserved round every part of the building appropriated to the audience; that all ironwork used in construction should be protected from the action of fire; that a separate exit should be provided from every tier or level, communicating directly with the street; that all doors be made to open outwards; that where the building is warmed artifically hot water only, at low pressure, shall be used; that the means of ventilation shall be explained on the drawings; that no rooms be formed over the auditorium or in the space under the same; that the scene-docks, property-rooms, and store-rooms be separated from the theatre or other buildings by fireproof construction; that provision be made for extinguishing fire; and that all gas-pipes be of iron.

The Metropolis Management and Building Act Amendment Act, 1878, received the Royal assent on the 22nd of July, 1878, but very little was done under its provisions with regard to existing theatres and places of amusement until the occurrence of the disastrous fire at the Ring Theatre at Vienna in December, 1881, which again called public attention to the subject.

In 1882 an Act was passed to confer various powers on the Metropolitan Board of Works and to amend certain Acts relating to that Board: the 45th section of this Act,—the Metropolitan Board of Works (various powers) Act, 1882 (45 Vict., c. 56),—gives the Board power to regulate the times during which the exit doors of places of public entertainment shall be kept open; the conditions under which such doors may be closed, and the persons to be charged with the duty of closing and opening the same; the nature of the fastenings to such doors; and the notices to be posted in such house, room, or place of public resort, specifying the means of exit.

The penalty for non-compliance with the Board's requirements is 10*l.* for every day, and the Board are authorised to enter and inspect any place of public resort for the purpose of ascertaining that their requirements have been complied with at any time.

On the 18th of April, 1882, shortly after the Easter recess, Mr. Dixon-Hartland called attention in the House of Commons to fires in theatres, and moved for a Select Committee to investigate the state of the exits of the metropolitan theatres and the appliances existing for the prevention and extinction of fires in theatres and music halls. Sir Wm. Harcourt, the Home Secretary, thanked Mr. Dixon-Hartland for calling attention to the matter, but assured him that in his (the Home Secretary's) opinion the then existing machinery was perfectly effective if put in force, adding that he had instructed Captain Shaw to report upon the condition of the London theatres; that he had already received reports as regards eight theatres, and that he had communicated with the owners of the rest. On receiving this explanation Mr. Dixon-Hartland withdrew his motion.

On the 17th of July, 1882, Captain Shaw presented to the Metropolitan Board of Works a report upon the remaining thirty-three theatres in the metropolis, he having on the 21st of March reported upon eight others. These reports were made at the instance of the Home Secretary, moved thereto, it was reported, by an exalted personage; the reports were printed and were forwarded to the Home

Secretary, and by him communicated to the various owners, but they have not been made public for obvious reasons. Captain Shaw's reports are of an exhaustive nature, and deal with every branch of the subject, including recommendations with regard to the site, the number of persons to be accommodated in different parts of the House, the lighting, warming, and ventilation, the storage and protection of scenery and properties, watching, and appliances for the extinction of fire, all of which are matters beyond the control of the municipal authority. It is satisfactory to know that, as regards the watching and fire-appliances, in only ten instances are they condemned as bad, and that out of these ten theatres eight have been rebuilt, and in eight cases only the appliances were reported to be insufficient and to require supplementing chiefly by additional lengths of hose.

There are at present forty-three theatres in London and the suburbs, of which number nine have been recently rebuilt or remodelled, and six may be called new, having been erected since the passing of the Metropolitan Building and Local Management Amendment Act, 1878, upon sites not previously occupied by theatres.

The following is a complete list of the theatres kept open under the authority of Letters Patent or of a licence from the Lord Chamberlain or from the Justices of the Peace :—

Adelphi Theatre.	Hengler's Grand Cirque.
Alhambra.	Her Majesty's.
Astley's (now Sanger's Amphitheatre).	Imperial.
Avenue.	Lyceum.
Britannia.	Marylebone.
Connaught (now Holborn)	Novelty.
Comedy.	Olympic.
Court.	Opera Comique.
Covent Garden.	Pavilion.
Criterion.	Philharmonic.
Crystal Palace.	Prince's.
Drury Lane.	Princess's.
Elephant and Castle.	Royalty.
Empire.	St. George's Hall.
Folly (now Toole's).	St. James's.
Gaiety.	Sadler's Wells.
Globe.	Standard.
Greenwich.	Strand.
Grecian.	Surrey.
Hackney or Clapton Park.	Savoy.
Haymarket.	Variety.
	Vaudeville.

The new theatres are the Avenue, Comedy, Empire, Novelty, Prince's, and the Savoy.

The total number of theatres licensed by the Lord Chamberlain in 1877 was forty-four, by the magistracy six, making, with the two patent theatres, Drury Lane and Covent Garden, a total of fifty-two, from which it would seem that the total number of theatres in London has decreased instead of having increased, as might be supposed from the numerous new theatres recently opened.

The course adopted by the Board with regard to old theatres is to make complete drawings to scale of every theatre, which include plans of the several tiers, elevations, and sections, so that any system of construction can be debated apart from the actual building, and the whole of the facts brought under the notice of the Board. The preparation of these drawings necessarily takes some time, weeks, and, in some instances, months being occupied in the admeasurement and drawing out of the plans, &c., of a single building. When the drawings of a theatre or other building are completed the premises are surveyed by the Superintending Architect of the Board, who reports as to the condition of the premises and suggests what alterations are, in his opinion, necessary to secure the safety of the public in the case of fire. The Architect's report is considered by a Committee specially appointed for the purpose, who inspect the building if they consider it advisable to do so, and report to the Board the result of their deliberations. The next step is to serve a draft notice upon the owner, and to invite the owner to confer with the Theatres and Music Halls Committee. The Board are not required by the Act of Parliament to confer with the owner, but they have adopted this course with a view to consult, as far as possible, the convenience of owners and managers, and in order to avoid making requisitions which may be found to be impracticable. At this conference the Board's draft notice is discussed, and any modifications suggested by the owner are taken into consideration and accepted or rejected by the Committee as they may think fit. It sometimes happens that the whole, or nearly the whole, of the Board's requisitions are agreed to by the owner without material alteration.

The Board then proceeds to serve a sealed notice upon the owner, having first obtained the consent of the Lord Chamberlain, and this notice becomes binding unless appealed against within fourteen days from the service of such notice. In the event of the owner appealing, the appeal is heard by an arbitrator appointed by the First Commissioner of Works, who has power to confirm the same with or without modifications as he may see fit, or may refuse to confirm the same, and order the payment of the cost of proceedings at his discretion. In the case of an appeal the time specified by the Board for the completion of the works (which is generally six months) does not begin to run until the day after the appeal has been decided by the arbitrator.

The principle upon which the Metropolitan Board has acted with regard to existing theatres has been to endeavour, as far as possible, to bring them in harmony with the Board's regulations for the construction of new theatres, regard being had to the special circumstances of each case. It is, of course, impossible to deal with the question of site, the action of the Board being confined by Act of Parliament to the enforcement of such structural alterations as may be considered necessary in order to secure the safety of the public, and in the case of old theatres the site has been perforce accepted as satisfactory, although in some cases it is notorious that the site does not fulfil the conditions which would be required in the case of the erection of a new theatre.

We break off here, reserving some further remarks on the subject for a future article.

CONCENTRATION.

IT is of daily increasing importance, both to men of science and to men of practice, to arrive at those clear and definite laws which regulate concentration. It is not by any means as an academical question that this is chiefly necessary. Concentration, to a certain extent, is the work of nature herself. Intentionally or unintentionally, it is always going on, over vast districts of the surface of the earth, from the simple natural action of increase of population. For good or for evil, the process is unsleeping and irresistible, and it becomes all those who have to do with the housing, the feeding, or the medical and sanitary care of their fellow-men, to make themselves fully acquainted with the nature and the details of the process.

But it is not alone, or even principally, as a natural process that concentration has to be regarded. It may be considered as a central principle in a large class of human actions. The birth of civilisation is due to a certain amount of concentration ; to that degree of association between individuals to which we owe the birth of families, of tribes, of municipalities, and of nations. The art of war has been described by one of its greatest masters as consisting in the concentration of overpowering force on definite obstacles, while at the same time maintaining such a distribution as to allow of the full service of necessary supplies to the attacking force. As in war, so in civil society, and so in mechanical or other physical operations. Rightly to balance the two energies of concentration and of distribution is the great outcome of practical wisdom.

In those appliances which, within the past fifty or sixty years, have placed the provision of the necessaries of life, for crowded masses of human beings, on a wholly novel basis, the importance of knowing how far it is advantageous to concentrate is cardinal. We do not, of course, imagine that the rate of increase of the seven millions of men, women, and children who now inhabit the valley of the Thames, and their tendency to agglomerate in one or other locality in that basin, is likely to be affected by any study of the rules of concentration. But given the material facts of the growth and distribution of the population, there are many points connected with their welfare which will be well or ill carried out, according as the measures taken are, or are not, in accord (whether designedly or otherwise) with the laws of concentration and distribution.

It may almost be predicated that concentration, as a general rule, tends rather to mischief than the reverse. That first and simplest form of association to which we owe,—let us say,—the village community, can hardly be spoken of as concentration. Up to a certain point, as yet undecided, the increase of population on a given area is or may be attended with the increase of health, wealth, and comfort. But the time arrives when health is affected by density of population ; and from that point (the position of which is determined by many conditions, of climate, of soil, of elevation, and of sanitary care), the death-rate rises with the increase of numbers. This is, perhaps, the simplest form in which it is possible to measure the effect of concentration.

Again, in cases where a destructive effect is intended, as in the procedures of war,—concentration pure and simple may defeat the object of those who have recourse to it. Mere aggregation of mass may have none but a disastrous result. The hosts of Xerxes, mass for mass, could have devoured the little band of Leonidas. At Crecy, at Agincourt, at Waterloo, mass was ever in favour of the French. But increase of rigidity, of hardness, of consistency, of temper of some kind, is an absolute necessary for the successful concentration of mass. An enormous hammer of lead, or even of iron, would tear itself to pieces on a small steel anvil. Concentration of mass may be simply mischievous unless attended by concentration of strength.

There is, however, one form of concentration to which we owe most of our material and scientific progress. That is what is usually known as the division of labour. By concentrating his thoughts on one study, or by continually directing his arm to one repeated operation, a man can, usually, do both more and better work than by any more dispersive direction of his powers. We do not speak of the educational effect on his character, but simply of the outcome of his work as a producer. And as it is with one workman, so it is with many. The idea of the factory is to facilitate that concentration of detailed energy which we call the division of labour. And thus we have seen of late, and seen with much regret, the monster manufacturer, merchant, or tradesman overshadow, stunt, and finally ruin those hundreds of smaller industrial workmen who are unable to compete with the organised power of concentration.

To this, however, there is a limit. It may be hard to say where the line is drawn. But of its existence there can be no doubt, and some light may, perhaps, be thrown on its whereabouts.

In the familiar case of the movement of an armed host, indeed, there is no doubt where the power of concentration finds its limit. It is in the genius of the general. Masses of men which Marlborough, Napoleon Buonaparte, or Wellington could have moved with the ease and certitude of pawns on a chess-board, may be simply massed as victims for slaughter by such generals as led the armies of France at Sedan or at Metz. And so in civil or mechanical procedures a degree of magnitude may be attained under the rule and guidance of a man of genius, which will fall into hopeless confusion on his death or departure.

A striking instance of the self-imposed limits of concentration may be traced in our railway system. With the admirable coaching system which rose to its zenith from 1815 to 1835 the object proposed and attained by the traffic manager was to take his passengers to the very heart of the towns linked together by the four-in-hand vehicles. When the iron horse began to displace the well-bred team, Robert Stephenson, Brunel, and our other early engineers would fain have run their trains to the "White Horse Cellar" or the

"Saracen's Head." But a hostile interest intervened. All over the country mayors, aldermen, burgesses, and municipal authorities of all kinds barred the way. To stop at the outskirts of a town was all that was permitted, and even that grudgingly. Oxford and Cambridge bristled up against the Great Western and the Eastern Counties lines as if they had been the very fortresses of the Consistory of Rome; and Stephenson had to halt at Camden-town and Brunel at Paddington.

As the new mode of transport developed its powers people became conscious of the fault committed. Then, at tenfold cost, and often but imperfectly, central stations rose in Birmingham, Manchester, and elsewhere. London itself was bridged and tunnelled, and for a certain time the idea of a central station for the metropolis was entertained, and the creation of one heart for the regulation of all the great arteries of the railway systems was regarded as, if not probable, at any rate desirable.

Beyond that stage we may be said now to have grown. There can be little doubt, we apprehend, that if between 1835 and 1845 a central London station had been built, the enormous concentration of traffic would by this time have rendered it inadequate. Space would have failed, at any admissible cost, for exterior growth. Streets and roads would have been blocked by accumulated traffic. Subdivision would at such times become more important than centralisation, and a certain number of suburban main termini, linked together by through lines, would have been desired. In point of fact, something approaching our present arrangement, only provided with better intercommunication, would have been adopted from the first, if the wants of the future had been foreseen, and if we had been wise enough to provide for them.

This question of concentration assumes just now its most serious form with reference to the main drainage of London and of other districts. It comes to the fore in the lamentable series of events, detailed in a recent number, that have resulted in leaving the Thames Valley undrained. We ought to think ourselves fortunate if we are not taught by pestilence that to concentrate the sewage of a vast province like London at one spot and then to throw it into the river was a mistake of the gravest kind. We are told now by the Metropolitan Board of Works that the sewage is "deodorised." But before the report of the Royal Commission this same Board told us that, as it then was, it was unobjectionable. The true mode of dealing with sewage has not yet been arrived at, thanks to the utter want of organisation in which the framers of the Health Bill of 1872 took delight. To concentrate on one spot a large amount of matter which was to be destroyed, without having arrived at any plan for effecting the destruction, is perhaps one of the most unfortunate instances of concentration which the world has yet seen.

One of the advantages proposed from concentration is the saving of cost of management. On this score some persons are very sanguine. To a certain extent they are justified. But it is only to an extent that may be very easily determined. When competing interests,—coaches, railways, docks, gas works, waterworks, or what not, grow up, or rather are forced into existence in rivalry with each other, duplicate establishments are formed, and a more or less completely double cost is incurred. And, as contrasted with a similar enterprise which from the beginning had been in one able hand, it is possible that the waste may be great. How far, however, it may be reducible by a subsequent fusion of the formerly competing interests is generally very doubtful. But it is a matter which, in each case, admits of anticipatory solution. A certain normal cost of management is well known to be appropriate to each great industry. It may be increased, to any amount, by quarrelling. It can never be reduced below the normal minimum; and experts familiar with the subject can generally give a shrewd guess as to that normal rate.

The one industry as to which it is not easy to fix a limit of profitable concentration is the manufacture of gas. That exception to the general rule is intelligible. In all cases of concentration,—take a coal station, for example,—three things have to be considered. The material for the industry has to be brought to the spot, to be treated on the spot, and to be conveyed from the spot. In the mineral traffic of railways the second operation appears at present to fix the limit of concentration. It is easy by the confluence of several lines of railway, to pour into a given terminus a stream of coal traffic such as it would prove impossible to sort or to arrange. Space fails; and the cost of shunting becomes enormous. Here, too, occurs a double difficulty in removal; for first the empty railway trucks have to be sent back by rail, and then the retail dealers' wagons have to be sent away by road. The station work at present limits the capacity of a coal station. Next to this, the wharfingers' or carmen's work,—or removal by road,—would do so. The amount of mineral that could be concentrated in a given time would be prodigious, but then the block would be absolute.

In gas the removal of the chief product, the gas itself, is so simple and so easy that no limit can be readily imagined as to quantity, and the procedures are so simple and orderly that the increase in area of ground required for increased production can be foreseen. As to the removal of the subsidiary products there may be more difficulty, but the amount received for residuals per 1,000 cubic feet of gas sold differs so little (regard being had to the price of coal) over thirty-five different great gasworks in town and country, that it may be doubted whether the difficulty of removing them has begun to tell, and for the simple concentration of coal an enormous amount is manageable.

In this respect, however, we think gasworks stand alone. For mineral trade, for merchandise, even for passenger traffic, for drainage and sewage, and for water supply, either the possibility of concentration beyond a certain point, or, at all events, its feasibility, is more than doubtful. The subject is not one that should be approached, as has hitherto been too often the case, under cover of a cloud of platitudes. It is one that demands the careful investigation of the man of business, an investigation which can hardly fail to be attended with a considerable success.

Of the influence of concentration on architecture we have not now room to speak. Its most obvious results take the form either of increase in the relative height of buildings, as we now witness in London, or in the creation of a quasi-palatial street architecture (as in Paris, and even more conspicuously in Turin), in which the individuality of the house, as an architectural unit, disappears. We recently spoke of the effect of concentration in raising the cost of urban life, and were able to point out the very simple numeric law which appears to regulate that increase. It is possible that in this case the evils induced by concentration may bring with them their own remedy. Such, however, is not the case as to the concentration of sewage,—the effect of which, as at present carried on at Barking, was illustrated most forcibly the other day by the seizure of two members of a scientific deputation to the spot with diarrhœa. With all that, abroad and at home, now menaces health, it is hardly too much to say that, unless we find an adequate mode of destroying sewage,—that is to say, of oxidising all the effete organic matter that it contains, for the mineral matter has agricultural value,—accumulated sewage will, perhaps not destroy London, but grievously scourge the inhabitants of the Thames valley.

NOTES.

WE learn that considerably over one hundred portfolios of designs for churches were sent in by architects desirous to compete for the Liverpool Cathedral. These were pretty soon reduced to forty, and then came the tug of war to result in the survival of the fittest. Among the twelve architects selected were Mr. Pearson, Mr. Waterhouse, Mr. Bodley, Mr. Brooks, Messrs. Paley & Austin, Messrs. Somers Clarke & Micklethwaite, Mr. Emerson, Mr. J. O. Scott, and Mr. Blomfield. It is rather odd that while in the case of the War Offices competition (in which Mr. Christian was a juror whose opinion probably had considerable weight) the selections were mostly from among architects who had not attained the highest position, in the Liverpool competition,—in which the same eminent architect is principal adviser,—the result seems to have been the selection of several of the best known church architects. Are we to look for the explanation in the fact that in the one case the designs to be judged of were mostly Classic, and in the other case probably all Gothic?

A PUBLIC MEETING was held last week at Woolwich which may possibly do more towards solving the problem of the best method of communication across the Thames below London Bridge than has been accomplished by the committees which have lately been engaged in discussing this question. The inhabitants of North and South Woolwich having waited so long in vain, have, it appears, determined to take the matter now into their own hands, and called a meeting to hear the particulars of a scheme for steam ferries, which has been designed by Mr. W. May, C.E., by means of which vans and carts with loads of any weight would be transported from one side of the river to the other without difficulty, and at a small cost. The main features of the scheme consist in an improved method of constructing the platforms and staging, so as to avoid any inclines for horses with heavy loads. At stations where the traffic will be the greatest there are to be one tidal and two travelling platforms, each of which is to run on a pair of rails securely fixed on the foreshore. The tidal platform is to be manœuvred by machinery as the tide rises and falls, so as to bring its deck on a level with the deck of the boat, and is to be worked automatically by means of electricity. The boats are to be fitted with double engines and twin screws, and lighted with the electric light. They are to ply three times in the hour between 5 a.m. and midnight, and the tariff is as follows:—Vehicles with load and one horse, 9d.; with two horses, 1s.; with three horses, 1s. 6d.; with four horses, 2s.; cab and driver, 6d.; pony-cart, donkey, &c., from 6d. to 3d.; passengers, 1d., with a discount of 25 per cent. on all return tickets, and of 50 per cent. on all workmen's tickets. The latter will thus be able to go to and from their work for a penny daily. There seems to be little doubt but that, if once fairly started, the scheme, which is in accordance with what we have repeatedly recommended, will prove abundantly remunerative, for the capital required to start it is estimated at 15,000*l.*, a sum which will probably be forthcoming from the inhabitants of Woolwich, who it is to be hoped will thus lead the way in providing for their own accommodation, and so point the moral of the late proceedings of the Metropolitan Board of Works in proposing to lay out 750,000*l.* on a single bridge.

IN a foot-note in our last, attention was called to what is, no doubt, a serious defect in the selected design for the new Admiralty and War Office. The principal court is only 80 ft. wide, and is closed at both ends (there being, however, gateways on the north and east sides); one of the courts in the south wing is 35 ft. wide, and the other courts are each only 25 ft. wide. The buildings fronting on the principal court are about 90 ft. high, and those abutting on the minor courts are about 100 ft. high. It is not fair to blame the architects for the exiguity of the means of internal lighting and ventilation; the fault lies rather with the Government, who, with ill-judged parsimony, persist in endeavouring to cram two large departments upon a site which is too small for the purpose. The question of the site has never been fairly discussed in Parliament, and it is not too late to appoint a Commission to consider the relative merits of the Great George-street site and the Spring-gardens site. The latter was selected by the First Commissioner on account of its comparative cheapness, most of the houses in

Spring-gardens being already occupied as Government offices, but we repeat what we have often urged before, that in the case of an important public building its economical erection should not be the only consideration, and that other questions should be taken into account, the foremost being the capability of the site as regards sanitation.

SOME of the competitors proposed to utilise the stone screen in front of the Admiralty in the new buildings, but there does not appear to be any provision to that effect in the selected design. We shall probably be told by the First Commissioner that he intends to preserve this screen, and its ultimate fate will in all likelihood be that it will be sent to join the Burlington House Colonnade, which is at present used as an impromptu gymnasium in Battersea Park.

THE prorogation of Parliament and the consequent scarcity of news has caused the recent fires that have taken place in the metropolis to be noticed more prominently than they would have been had they occurred during the session, and the newspapers are full of suggestions intended to guard against a similar loss of life to that which lately took place in Pimlico. One of the most obvious precautions would be to make the upper floors of every house fire-resisting. This might be done by pugging between the joists with coke-breeze and Portland cement. The additional cost of this treatment of the floors of a three-story house of a rental of from 30*l.* to 35*l.* per annum would not exceed 5*l.* The Legislature recently required the site of every house to be covered with a layer of concrete to prevent the damp rising, and it would not be unreasonable to require this additional precaution to secure the safety of the tenants in the case of fire.

IT is impossible for us to read the accounts of the alarming fire which occurred on the morning of the 15th inst. in the rear of the Mansion House Railway Station without feeling serious misgivings as to the safety of large numbers of workpeople similarly situate to those who were with so much difficulty rescued from the burning building in question. Here is a case in which what is described in one account as the only available staircase to several floors occupied by male and female workers is set on fire and becomes impassable; and this, be it observed, during the working-hours of the day. How long will it be before the papers will have to chronicle an appalling sacrifice of life under such circumstances as these? And how much longer will it be tolerated that large establishments, occupying several floors, and employing, it may be, hundreds of hands, are "provided" (as are some that we know of) with only one staircase, and that of most combustible materials, thus making the workshop a veritable death-trap in case the staircase is on fire and no other means of rescue are available? Lofty buildings of the workshop type should, under such conditions as those mentioned, be provided with at least two staircases, and it goes without saying that these staircases and their approaches should be as far as possible of incombustible materials, and so constructed as to resist the rapid spread of fire. In addition to these obvious precautions, other safeguards should be provided. Theatres have lately had their due meed of attention in this particular, and it behoves all concerned (whether as guardians of the public safety or as employers) to see that our workmen and workwomen are not cut off from all means of escape from fire while pursuing their occupation.

RAILWAY travellers passing through Rugby of late will have observed a new station rapidly rising. The poor and shabby station of the London and North-Western Railway has long been so familiar an object to the traveller to and from the North that he will almost experience a feeling of regret at seeing the new building about to supersede the old one. But in truth it was high time that Rugby had a larger and better station. We do sincerely hope, however, that the great company to whom the line belongs will take care that some attempt is made to make the new station not only useful for its practical purposes, but a pleasing piece of architecture. A place like Rugby, the seat of an historic public school, ought not to be put off with a building hideous to the eye, as is the case with the majority of railway stations. Without attempting striking artistic effects, the architect of railway stations has admirable opportunities for doing work which shall be pleasing to the eye. It is a thousand pities that more attention has not been given to this aspect of the railway station question, so that the opportunity may be seized of doing something to improve the neighbourhood of railway stations from an artistic point of view. The actual cost of carrying out a pleasing design is but at the most a trifle more than that of carrying out one without artistic merit or ornamentation. Among roadside stations many will recall Box-hill, as an instance of a successful attempt to break away from the ordinary routine of station architecture. But large buildings, such as the new station at Rugby, should at any rate have some care bestowed on their external appearance as well as on their fitness for practical use.

THE letter from Mr. Charles Barry which was read at the last meeting of the Metropolitan Board of Works deserves a passing note, inasmuch as it announced the intention of the Governors of Dulwich College, who are large land-owners in the sylvan suburb, to allot seventy-six acres of land to the purposes of a public park. But it appears that the Governors cannot appropriate the land in question to such a purpose without the authority of a special Act of Parliament, and for specified reasons they are unable to take upon themselves the trouble and expense of this process. Accordingly they have asked the Board to promote a Bill in Parliament authorising the Governors to set apart the land for the purposes of a park, and to hand it over to the Metropolitan Board for custody and maintenance. The letter was referred to a Committee of the Board for consideration, and it is to be hoped that no technical difficulty will intervene to prevent the appropriation of the land to the purposes of a park. Railways and tramways, and the work of the house-builder, are rapidly altering the face of this still pleasant suburb. The picturesque aspect of Croxted-lane and other spots has been effaced, to the regret of many besides Mr. Ruskin.

IT is proposed to form a new society for the preservation of London antiquities. We should have thought that there are already sufficient societies for that purpose, and that to start a new society would only have the effect of crippling the resources of existing societies. What is the Topographical Society for London (which was established with the laudable object of preserving a record of Old London, now fast vanishing away) doing?

IF we may believe the account communicated to the daily papers, a French military engineer, Captain Renard, has solved the problem of propelling and steering balloons irrespective of the wind. The motive power is said to be electricity, served from a series of accumulators, providing a sufficiency of power for several hours. The balloon to which the machine was attached, was experimented with over Meudon, and brought round in a semi-circle against "a slight breeze";—so the *Times* correspondent of Wednesday last. We should hesitate to accept this vague account of the partial solution of the problem (for to travel a short distance against a slight breeze is not, after all, to accomplish much) as an indication of the commencement of a new era in locomotion; but we shall, at all events, look with interest for further and more exact particulars. It may be that aërial locomotion is only a question of time, but it is probable that a considerable period will elapse before all the difficulties connected with it are overcome.

ON Monday afternoon we attended, at the invitation of Mr. Parker-Rhodes, to see him "square the circle" by means of his "invention of a geometrical instrument for commercial and educational purposes, which discovery and invention he offers gratuitously to this and foreign countries." Briefly stated, the method which Mr. Parker-Rhodes adopts to obtain the square of a circle or of any irregular-shaped figure is to take two sheets of stout millboard, superposed. The upper sheet is perforated with the circle or the irregular-shaped figure to be squared, either full-sized (where practicable) or to scale. The lower piece of millboard is placed beneath the perforated piece, so as to form, as it were, the bottom of a shallow trough whose outline is formed by that of the perforation of the upper piece. Into the shallow trough so formed small shot is poured until the whole area contained within the lines of perforation is covered with shot (in one layer), as closely packed together as possible. The amount of shot thus enclosed is then poured on to a square slab, bounded on two of its sides by raised borders or ledges, ruled and figured; and by means of movable L-squares (varying in size according to the space occupied by the shot) the shot is "cornered" on the square slab, and the dimensions of the square covered by it seen at a glance. Mr. Parker-Rhodes thinks that his invention would be useful to the land surveyor in dealing with a piece of land of many angles and unequal sides, as he could, after obtaining the actual measurements of the sides of the land, make a drawing of its outline to scale, and then cut out this figure in millboard, see what quantity of shot would be required to fill the area of the perforation, and then ascertain the size of the square which the same quantity of shot would fill. Mr. Parker-Rhodes must have a delightful idea of the simplicity of surveyors.

IN the *Builder* for May 10th we printed a portion of a paper read at a meeting of the Balloon Society by Mr. H. Lefevre, on "The Study of Earthquakes," together with a letter from a Mr. J. S. Green, of Yokohama, addressed presumably to the reader of the paper, and forwarded to us with his manuscript, as a kind of rider to it. From a copy of the *Japan Gazette*, which a correspondent has obligingly forwarded to us, it appears that Mr. Lefevre is accused of having taken much of his information unacknowledged from the proceedings of the Seismological Society of Japan, published in the *Japan Gazette*, and that a Mr. T. R. Green is also, for reasons we do not make out, very angry about it, and very anxious to state in the Japanese paper that he is not Mr. J. S. Green,—a proposition which appears self-evident. We need only observe that we printed Mr. Lefevre's paper, as we print any other paper read at a public meeting, on the responsibility of the author, and that it rests with him, and not with us, to answer the charges made against him from Japan, and to settle the claims of the two Mr. Greens of Yokohama.

THE ARCHITECTURAL ASSOCIATION'S EXCURSION.*

(With Illustrations.)

WEDNESDAY morning in last week saw the excursionists on their way through the pleasant Suffolk roads to Lavenham, which boasts the magnificent church illustrated in our last week's number. It is, indeed, a beautiful building, and is, in some respects, more easy of comparison with modern work than most Mediæval churches, in that it is (except the earlier chancel) practically all of one style instead of having gradually grown up through different periods. Many of the smaller churches one loves for their very mixture of styles; they carry their history written on their front. Like many faces, they charm as much by their expression as by their features. Lavenham, however, is an acknowledged and conscious beauty. It is purely a bit of design, owing nothing to chance, but all to skill. It was the result of the

* See p. 223, *ante*.

prosperity which successful trade induces. In the fifteenth century Suffolk and Norfolk were the seat of a large woollen industry, which has now migrated to Yorkshire, leaving many villages hampered with magnificent churches, far too large for the diminished population. Indeed, in some parts of Norfolk it is melancholy to go into church after church and find them too big to accommodate the entire parish, all told. Lavenham, however, is not in this sad condition, for, though the ancient glory of the place is dimmed, there is plenty of life left, and the church is treated with all befitting care. It is almost entirely Perpendicular in style, having been built by two wealthy and powerful families towards the end of the fifteenth century,—the noble De Veres and the commercial Springs, who were closely allied by marriage. After the fashion of the age, the arms of the founders play a conspicuous part in the decoration of the fabric, and help to form a particularly fine base all the way round, the five-pointed mullet of the De Veres serving the purpose very well. Those were days when heraldry was still a living art, and a man's arms gave legitimate scope for unaffected decoration. May not the nineteenth century sometimes ease its despairing envy a little by reflecting how very much circumstances were in favour of the Mediæval architect? The buttresses are particularly good, and so is the parapet, except for the introduction of a large leaf out of all scale. Inside, the quiet, handsome roof strikes one as more dignified than the florid timber-work of Woolpit; but if florid work is desired, no better specimen could be found than the wonderful Spring pew, now in the north aisle. It is inclosed by a screen, the tracery of which presents an infinite variety of beautiful carving. It is true that the old Gothic forms are entirely superseded, but the delicacy of the carving, the vigour of its lines, and the exuberance of fancy displayed, must delight all whose sympathies are not very narrow. We hope to illustrate one or two scraps from this work, which probably owes its peculiar characteristics to Flemish influences. There are several other good screens, and some good brasses, in the church, while in the village are a few interesting houses and the Wool-hall.

Leaving Lavenham, a few miles' drive brought the party to Melford and the adjacent Hall of Kentwell. Here, again, it is not the detail which charms, but the general air of the place, its picturesqueness, and, above all, its colour. The red brick has toned down into an infinity of shades, the mortar has fallen out, and covered the surface with a network of delicate black lines, and brilliant lichens creep here and there, carrying all lovely hues, from orange to tender grey, wherever they go. Tall chimneys rear their insecure length in picturesque confusion; dormers peep out in unexpected places; a long length of timber and plaster overhangs the moat on its wooden joists; ivy clambers along the terrace walls and droops into the still waters of the moat; and the sketchers rise from their work like men who have feasted on bon-bons. Of solid food there is little: nothing to measure. But they find good, wholesome diet at Melford Church.

Like Lavenham, Melford Church is practically of one design throughout, although the pillars of the nave seem to be some decades earlier than the rest of the work, which ranges from 1450 to 1490. Here, as at Lavenham, the size and number of the windows recall "Hardwick Hall, more glass than wall." When the church was in its prime, before the first iconoclasts had left their mark upon it, it must, indeed, have been a wonderful sight. Every window glowed with rich glass; across the whole breadth of the church stretched the "fair rood-loft with the rood; Mary and John of every side, and with a fair pair of organs standing thereby." * Beyond this, at the east end, stood the altar with the Crucifixion over it, and on each side "a goodly tilt tabernacle, reaching up to the roof of the chancel." At the end of the "Jesus Ile" stood another altar with a fine reredos, and on each side "a fair tilt tabernacle," one with a figure of Our Lord, the other enshrining Our Lady of Pity. No church could have been richer in works of art or in its vestments and furniture. There were in the vestry, says old Roger Martyn, whose account we have been quoting, "many rich copes and suits of vestments," and a cope-press with "devices to hang on all the copes, without folding or frumpling of them."

All this glory and splendour lasted barely a hundred years, for with the Dissolution of the Monasteries and the throwing off the Papal yoke, there arose a spirit of antagonism to much of the religious superstition hitherto prevalent; and ignorant zealots indulged their natural instinct for destruction by smashing or defacing as many of the superstitious paintings, coloured windows, and images as they could. It is at least charitable to suppose that their destructiveness, like Falstaff's cowardice, arose from "instinct." It would be, however, a mistake to suppose that the Puritans are responsible for all the mischief. No doubt they did much, and zealots like Dowsing thought they were doing God's service in dishonouring the memorials of the "Scarlet Woman." But nearly a hundred years before the Commonwealth the tide of destruction had set in, and the churchwardens of Melford gave one man sixteen pence in 1562 for "ye scrapeinge owt of the payntinges all ye lengthe of ye quire," and another man 2s. in 1579 for "defaceinge of ye sentences and imagerye in ye glasse wyndowes." And no doubt these are but isolated instances of the vandalism of the times when Shakspeare sighed to see,—

"Brass eternal slave to mortal rage."

Notwithstanding the liberality of the churchwardens of Melford towards their destroying agents, there is still some very fine glass left, although it is not in its original position.

Long Melford Church is remarkable in that the names of its founders and benefactors are given in long inscriptions that run the length of the parapets, desiring prayers for the souls of those mentioned, who repaired such and such arches, or covered the porch, or glazed certain windows. The inscription round the Lady-chapel, for instance, calls on the reader, in the orthography of the time, to "pray for the soul of John Hill, and for the soul of John Clopton, esquire, and pray for the soul of Richard Loveday, butler with John Clopton, of whose goods this chapel was embattled by his executors. Pray for the souls of William Clopton, and Margery and Marg'y his wives." The good man had two wives of the same name, and apparently, to avoid confusion, had recourse to calling one Margery and the other Marg'y. We are also requested to pray, not only for the soul of John Clopton, but also "for all the souls that the said John is bound to pray for." The inscription closes with calling Christ to witness that the builder did not place these names on record from vainglory, but that the souls might be remembered. When we recollect that within some half-century from the utterance of this devout prayer, all praying for departed souls was held to be superstitious, and is so held now by the frequenters of the very church where the impassioned prayer is inscribed, may we not reflect without horror that perchance our great-grandchildren will forego with equanimity some of the privileges we now hold most precious, and forsake without disaster the views we now most highly cherish?

Inside the church one of the most curious features is the Clopton Chapel, where on a wood cornice are painted a number of verses, said to be the production of Monk Lydgate, the poet. They have suffered much at the hands of many workmen, but a great deal may still be deciphered. They are in effect a long cry for mercy, many of the verses ending with the refrain,—

'Graunt or we deye shrifte hosell and repentaunce."

The Cloptons, who did so much towards the erection of the church, whose litany adorns their chapel, and who so ardently desired the prayers of the world for their souls, lived at Kentwell, but in an older and different house from that which now exists. They also built the remarkable Lady-chapel at the east end,—a work of excellent proportion outside, and of very curious plan. There are several interesting monuments and brasses in the church, the finest being a Renaissance monument to Sir Wm. Cordell, who died in 1580. This is a work of great refinement and delicacy; of course it is not Gothic, not,—as Pugin would have said,—not Christian; nevertheless, it is well conceived, well balanced, full of grace and freedom, and the mouldings are particularly refined. Indeed, as a matter of sheer design and display of imagination, the finer Renaissance monuments will bear comparison with anything of an earlier era.

With Long Melford the day's work ended; and a better day could not be spent in any county. But before the village was left the rector, the Rev. C. J. Martyn, who had done all he could to further the objects of the Association, sped his parting guests with a cup of afternoon tea, an attention much appreciated by the hot and weary sketchers.

On Thursday, the 14th, the first place visited was Hawstead, a church of various dates, but with a particularly elegant tower, built by the Sir R. Drury who lived at the demolished Hall or Place. There are some good brasses and monuments, among them a monument in the north wall of the chancel to a Fitz-Eustace, with a boldly-carved floral pattern on the arch. There is also a delicate and charming Renaissance monument to Elizabeth Drury, who died in 1610. She was the only daughter of the last of the Hawstead Drurys, whose memory lives in Drury-lane. She is said, by a local tradition, to have died from a box on the ear administered by her father; but the only reason for this supposition is that her effigy is carved with her head leaning on her hand, a position which brings to mind the remarks of Bosola to the Duchess in John Webster's play of the "Duchess of Malfi" (1623). Bosola says, "Princes' images on their tombs do not lie, as they were wont, seeming to pray up to Heaven; but with their hands under their cheeks, as if they died of the toothache." Elizabeth Drury is just as likely to have died of the toothache as of a box on the ear. But, however she may have died, she was particularly well buried; and, to judge by the work, Italian artists may have been employed on her tomb.

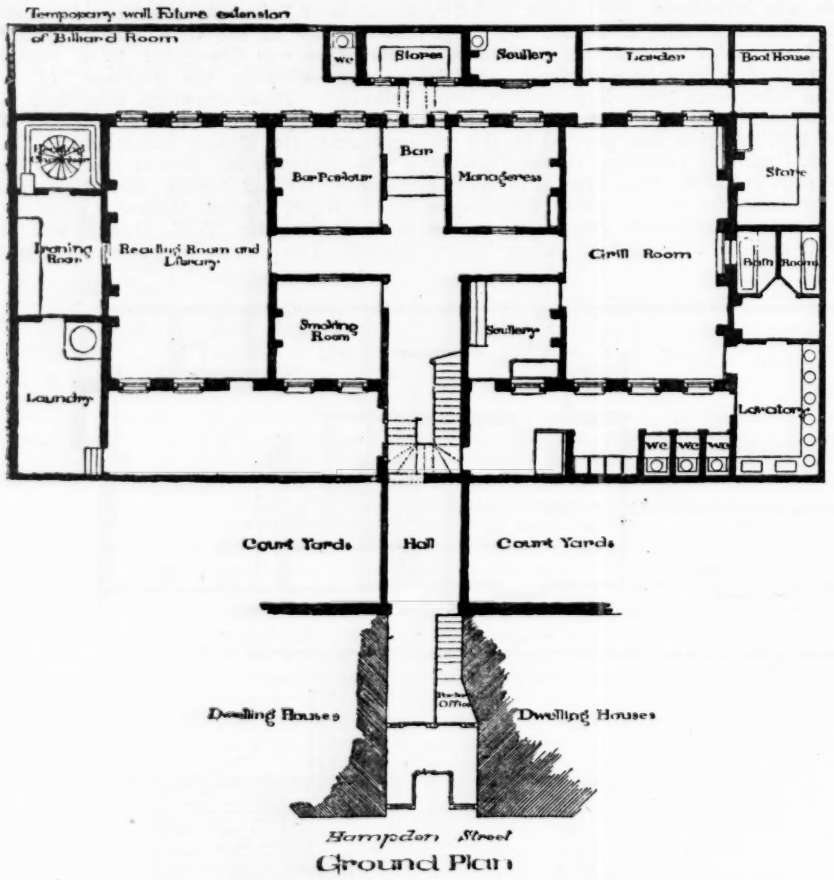
Stanningfield Church only detained the party a quarter of an hour, which, however, gave time to sketch the pleasant little tower, and to look at the font and the Rookwood monumental slabs. Thence a short drive led to Coldham Hall, once the seat of the Rokewoods, and built in 1574 by Robert Rokewood. The details of the porch, as well as the mullions and labels, are of brick covered with stucco, as are most of the dressings of domestic buildings about here. The details are, architecturally speaking, extremely poor, but here, as at Rushbrooke and Kentwell and Pakenham, poverty in detail is atoned for by picturesque grouping and fine colour. The house is interesting historically from the fact that the son of the builder, Ambrose Rokewood, was concerned in the Gunpowder Plot, and suffered death at Tyburn in 1605. The unfortunate gentleman seems to have been more sinned against than sinning, for, as he touchingly said at his trial, "he had been neither author nor actor," but only the depositary of the terrible secret, which, out of love to his friend Catesby, "whom he loved above any worldly man," he would not divulge. It must have been true love that was content to prove itself at the cost of life.

Plumpton Hall came next on the list, where Mrs. Bevan entertained the whole party at luncheon, and afterwards read a short paper on the history of the place, from which the following is extracted:—"Lands in Whepsted were given to the Abbot and Convent of St. Edmund at Bury as far back as 1040, in the reign of Edward the Confessor, and Plumton was a dairy and orchard farm to the Abbey. At the Dissolution, about 1540, the manor of Whepsted and all lands belonging to it, including Plumton, were granted by the Crown to Sir William Drury of Hawstead, and his heirs, in consideration of 819*l.* 11s. On the partition of the Drury estate, in 1618, in consequence of the death of Elizabeth, sole daughter and heiress of Sir Robert Drury, who was betrothed to Henry, Prince of Wales, and is said to have died at the age of fifteen, of a box on the ear given by her father, this part of the property fell to the share of Diana, wife of Sir Edward Cecil." The property eventually came into the hands of Sir Thomas Hammond. As a favourite attendant and high official in the household of the Prince Regent, being his first Equerry, and Clerk Marshall of the Royal stables, Sir Thomas Hammond lived much in the gay world of the day, and adopted the rage for French fashions which prevailed in the Whig party of the time during Napoleon's career as First Consul.

Plumton, which had been up to this time only a farmhouse with a good deal of timber in the building and with stout old oak floors, was now transmogrified by a French architect into an imitation of a French château, six of the old rooms in three stories of the old house being

* See Sir Wm. Parker's "History of Long Melford," quoting an account written about 1550.

There is a hot and cold water supply on each floor, and in connexion therewith there is also a supply in case of fire. The house over the principal entrance is fitted up as bedrooms for the manager and servants. There is a large and cool cellarage. A site has been left for a billiard-room, should the tastes of the members of the club demand the addition hereafter. We append a ground-plan.



Ground Plan

The Hampden House Residential Club.

An advertisement relating to the Club appears in another column. The experiment is one which has our best wishes.

Illustrations.

LEEDS MUNICIPAL BUILDINGS.

WE are enabled this week to give a perspective view and plans of these buildings, together with a view of the interior of the News-room in connexion with the Free Library section of the buildings.

The buildings, which were opened three or four months ago, have been in progress for about five years, and are situate in the immediate neighbourhood of the Town-hall, having their principal frontage in Calverley-street. Without staying now to describe the exterior of the building (which is clearly shown in the view), we will give a few particulars as to the internal arrangements of the building. As will be seen by reference to the plans, the Library and Museum Department has been isolated from the business offices, and has its separate side-entrance (in Centenary-street). The News-room is 80 ft. long by 40 ft. wide, and is divided into a broad nave and aisles (we quote from a long description given in a Leeds paper) by arcades of six arches, carried upon polished granite pillars. Each column has a granite base and a carved stone capital,—no two capitals being alike. The construction of the ceiling of this apartment will be readily apparent by a reference to the illustration. It consists of a series of segmental vaults springing from transverse wrought-iron girders, the surface of the vaults being of a sort of mosaic-work in hexagon bricks,—red, buff, grey, and blue, with golden bosses. The walls are tiled throughout, and relieved with medallion portraits in relief of Homer, Shakspeare, Milton, Goethe, Burns, Scott, Horace, and Macaulay. These medallions have been executed by Mr. Creswick, sculptor, London. At night, light will be provided by means of incandescent electric lights. The Lending Library is situated on the first floor, over the news-room, and is similar as to size and plan, though terra-cotta takes the place of granite as the material for the columns and arches, while the ceiling is vaulted in concrete, finished with plaster, and divided into panels by moulded ribs, the whole being decorated in colour. What may be called the nave of this apartment is set apart for the public, while a continuous counter incloses the aisles, which contain the book-shelves. On the same level as the Lending Library is the Museum, 32 ft. square. On the second floor is the Reference Library, which extends over the lending library and museum, and has a height of 36 ft. from floor to ceiling, terra-cotta arcades dividing the room into nave and aisles. The roof is semicircular, and is divided into bays by wrought-iron principals carried on moulded stone corbels. Altogether, Leeds may be congratulated on its free library.

The main entrance to the Municipal Offices, in Calverley-street, gives access to a short flight of granite steps leading up to a vestibule, 23 ft. square, on either side of which are detached columns of Devonshire marble, with marble bases and capitals, carrying an entablature and cornice of Caen stone. The inner hall, reached through double swing-doors, rises through the whole series of floors, and culminates in a lantern light. The lettering on the plans sufficiently describes the purposes to which the various apartments are allotted, but as to the "Pay-office," we may mention that it is 78 ft. long by 38 ft. wide, having a counter 62 ft. long. The central portion of the counter is to be given over to the Water Department, that on the right to the Rate Department, and that on the left to the Gas. Beyond the counter are rows of double desks for the use of the clerks of these several departments. Here (as in almost every room in the building) tiles have been largely used for decorative purposes. On the second floor are the rooms of inspectors, collectors, and other officials.

Mr. George Corson, of Leeds, is the architect, the general contractor was Mr. James Wood, and the clerk of works was Mr. Osborne.

LONG MELFORD CHURCH, SUFFOLK.

THE Church of the Holy Trinity, Long Melford, is one which is nearly always grouped with that at Lavenham, of which we gave a view last week; for they are kindred works in the same neighbourhood. This also was one of the churches visited by the Architectural Association on their excursion last week. Like Lavenham, this is a flint church, but depending for its decorative treatment to some extent on surface designs (arcading, &c.) worked out in stone and flints of different tones. The carved stone ornament is less prominent and less bold in character than that at Lavenham; and the total effect of the church is sadly spoiled externally by the bare and ugly eighteenth-century tower, which, however, we suppose, critics of a certain school would tell us ought to be regarded as of equal interest as an example of the taste of its day. It certainly is historically interesting to know that people in the eighteenth century knew no better architecture than this; but if they had left the damning fact recorded somewhere apart, instead of tacking it on to Long Melford Church, we could have better forgiven them.

Like Lavenham, Long Melford owed its foundation in great measure to the generosity or religious zeal of rich cloth-merchants, the Cloptons having been the family specially prominent as founders. The interior, as is well known, contains much fine and interesting work; the Lady-chapel being especially beautiful. A small bas-relief of the Offering of the Magi is on the north wall near the chancel. The church contains also a fine specimen of a Renaissance tomb, that of Sir W. Cadell, in the chancel. Lavenham and Long Melford were described at some length in the *Builder* a few years ago.

THE "MILLER" MEMORIAL HOSPITAL, GREENWICH.

THIS little hospital has been erected on ground adjoining the Royal Kent Dispensary, as a memorial to the late Canon Miller, the founder of Hospital Sunday. Owing to the very confined nature of the site, it was thought desirable to adopt the circular form of ward, by which means more free access of air and light is obtained to the wards than could possibly be the case with a rectangular form. The hospital at present consists of an administrative building, and one ward pavilion of two stories. In the future it is intended to add a corresponding ward pavilion on the ground adjoining southwards, of which the freehold belongs to the committee. Each ward is for ten beds, and has attached, but separated by a cross-ventilated lobby, w.c. and slop sink, and broom cupboard. The warming is by means of three Boyd's hygiastic stoves, and to each ward are three extraction-flues, carried up side by side with the smoke-flues, from which they are separated by thin plates of iron. The floors are of iron and concrete, covered with wood blocks, and under every bed is one of Ellison's "radiator" ventilators.

The basement of the administrative building is occupied with stores and cellarage. The ground-floor contains a small operating-room, separation-ward for two beds, and ward, scullery, and bath-room. The first floor contains ward, scullery, bath-room, separation-ward, and bedroom and sitting-room for matron.

On the second floor are the kitchen offices, and two rooms for nurses; and on the top floor are a day-room for nurses, bath-room and w.c., and bed-rooms for nurses and servants.

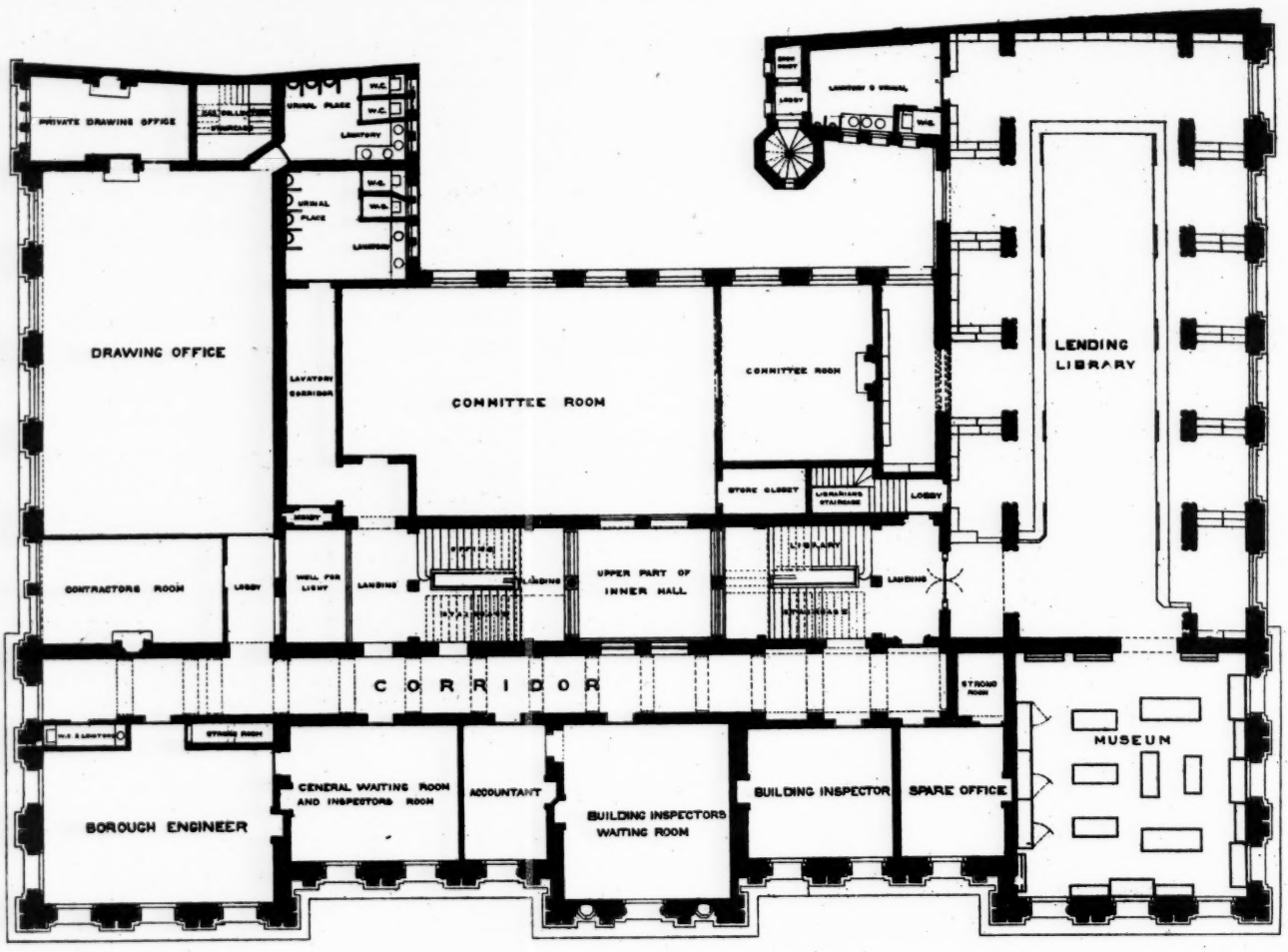
In one angle of the site is a small mortuary and *post-mortem* room.

The buildings have been well carried out by Mr. J. L. Holloway, of Queen's-row, Peckham, under the superintendence of the architects, Messrs. Young & Hall, of 17, Southampton-street, Holborn.

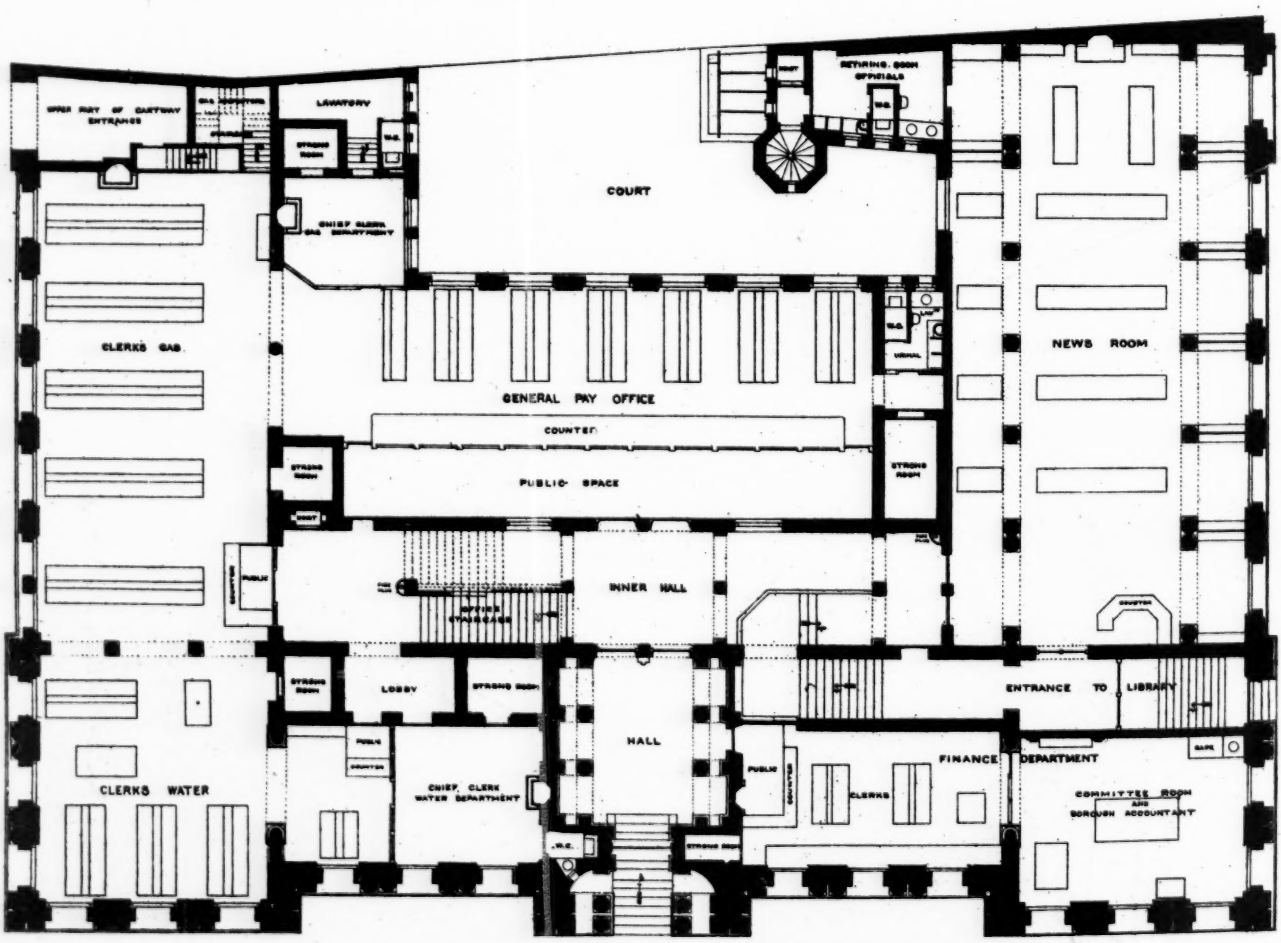
SKETCHES AT PLACES VISITED BY THE ARCHITECTURAL ASSOCIATION.

SOME particulars of the buildings and details which form the subjects of these sketches will be found in our account of the Association's Excursion (see pp. 223, 252, *ante*).

Organ Music at the International Health Exhibition. — Arrangements have been made for extra Recitals on the Organ of the Royal Albert Hall in connexion with the International Health Exhibition. They will take place daily from twelve to one, so as to afford to all who visit the Exhibition an opportunity of hearing this organ. In many cases the country visitors have to leave early, and are thus unable to avail themselves of the usual recitals at three and seven p.m.



PLAN OF FIRST FLOOR



PLAN OF GROUND OR PRINCIPAL FLOOR

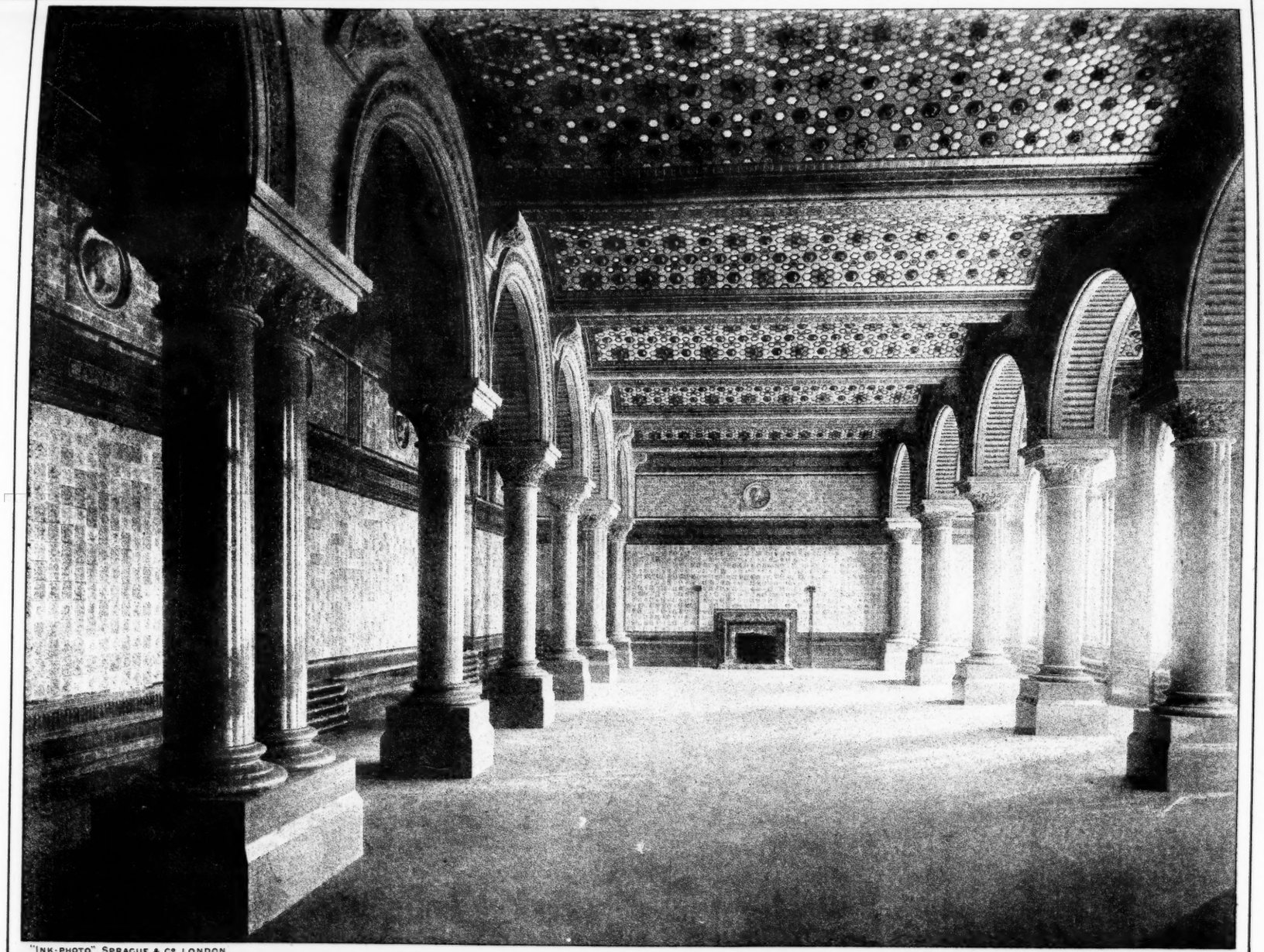
SCALE OF FEET

Wyman & Sons, Photo-Litho. 6 Queen St London, W.C.

MUNICIPAL OFFICES, LEEDS.—Mr. Geo. Corson, Architect.—*Plans.*

EXTERIOR VIEW.

Exterior View.

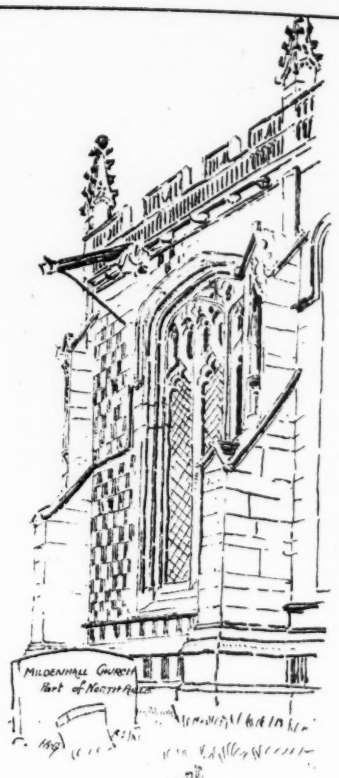


"Ink-Photo", Sprague & Co. London.

Reading Room of Free Library.

LEEDS MUNICIPAL OFFICES, Mr. Geo. Corson, Architect.

From Photographs by Mr. E. Wormald, Leeds.



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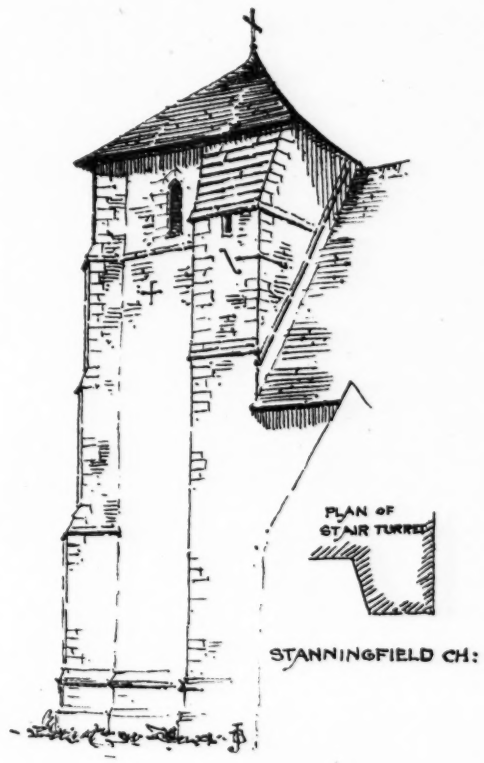
East End, Mildenhall Church Suffolk



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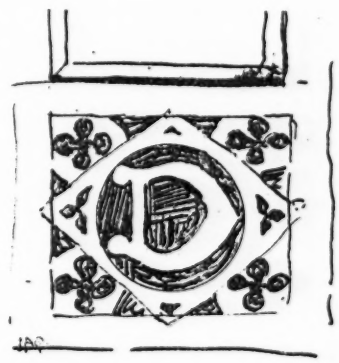
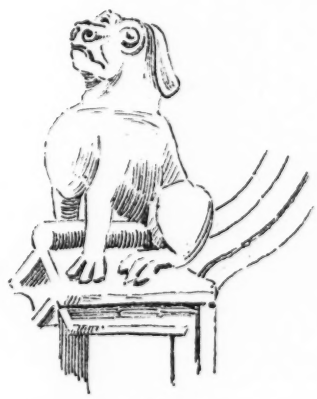
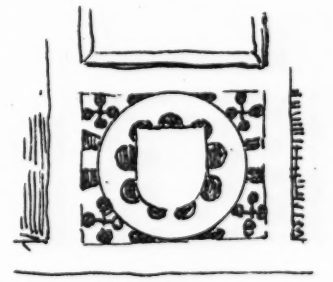


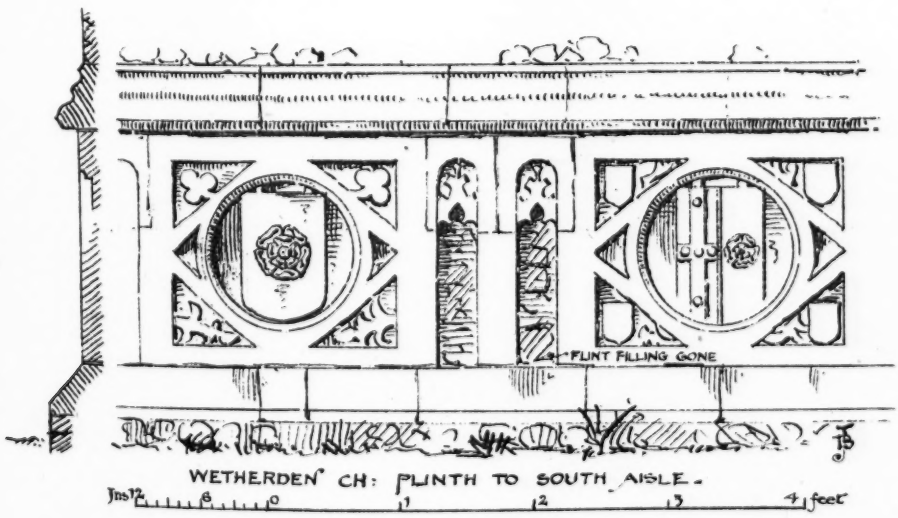
Pier to railing round moat
Rushbrooke Hall.



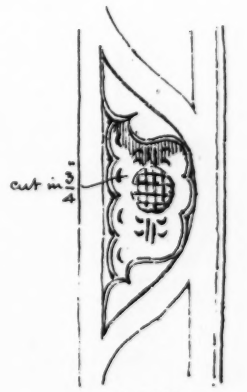
on Bench end
in Woolpit Church



PARAPET SOUTH AISLE
FORNHAM ALL SAINTS.



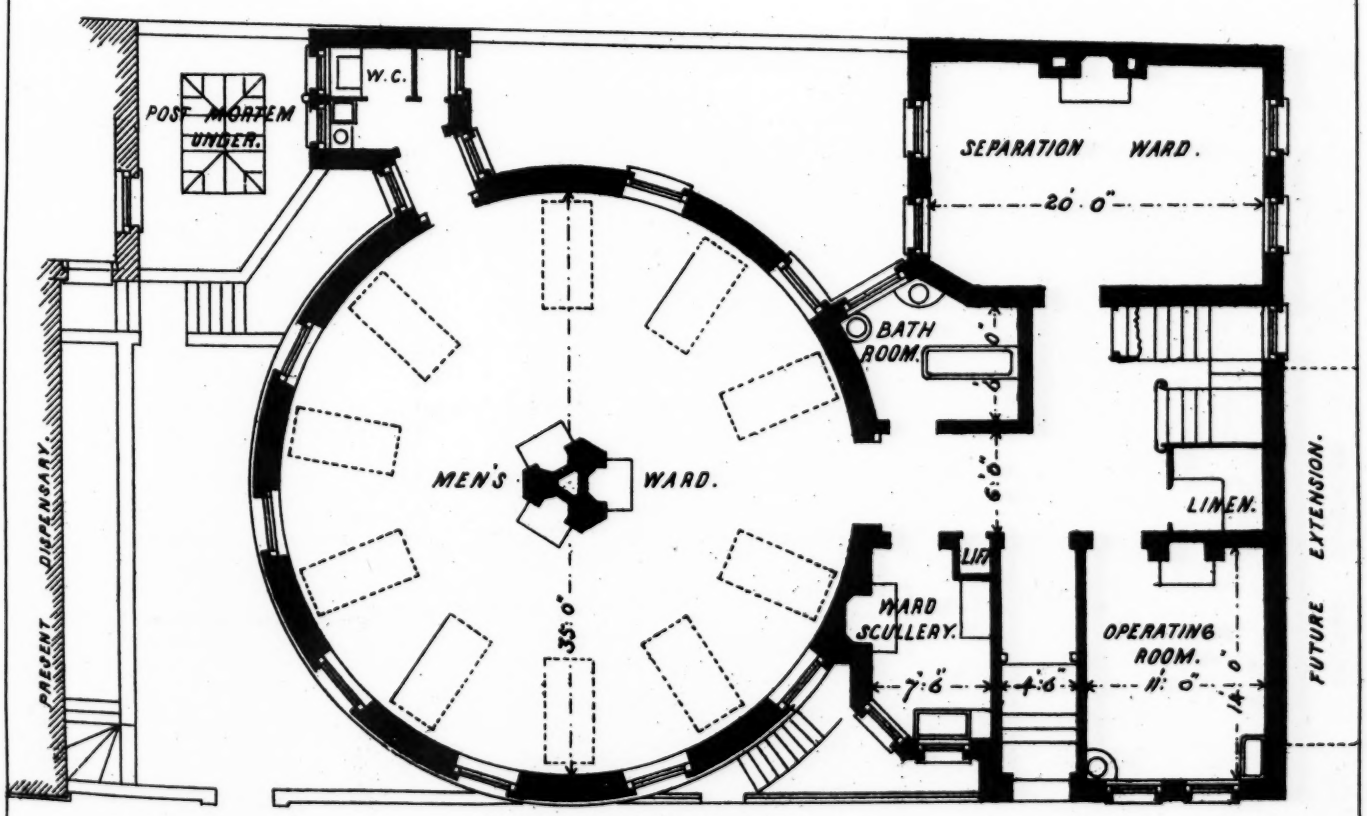
WETHERDEN CH: PLINTH TO SOUTH AISLE.



on jamb of Door
West Stow Manor.

C. Queen St. London. W.C

FRONT ELEVATION.



GROUND FLOOR PLAN.

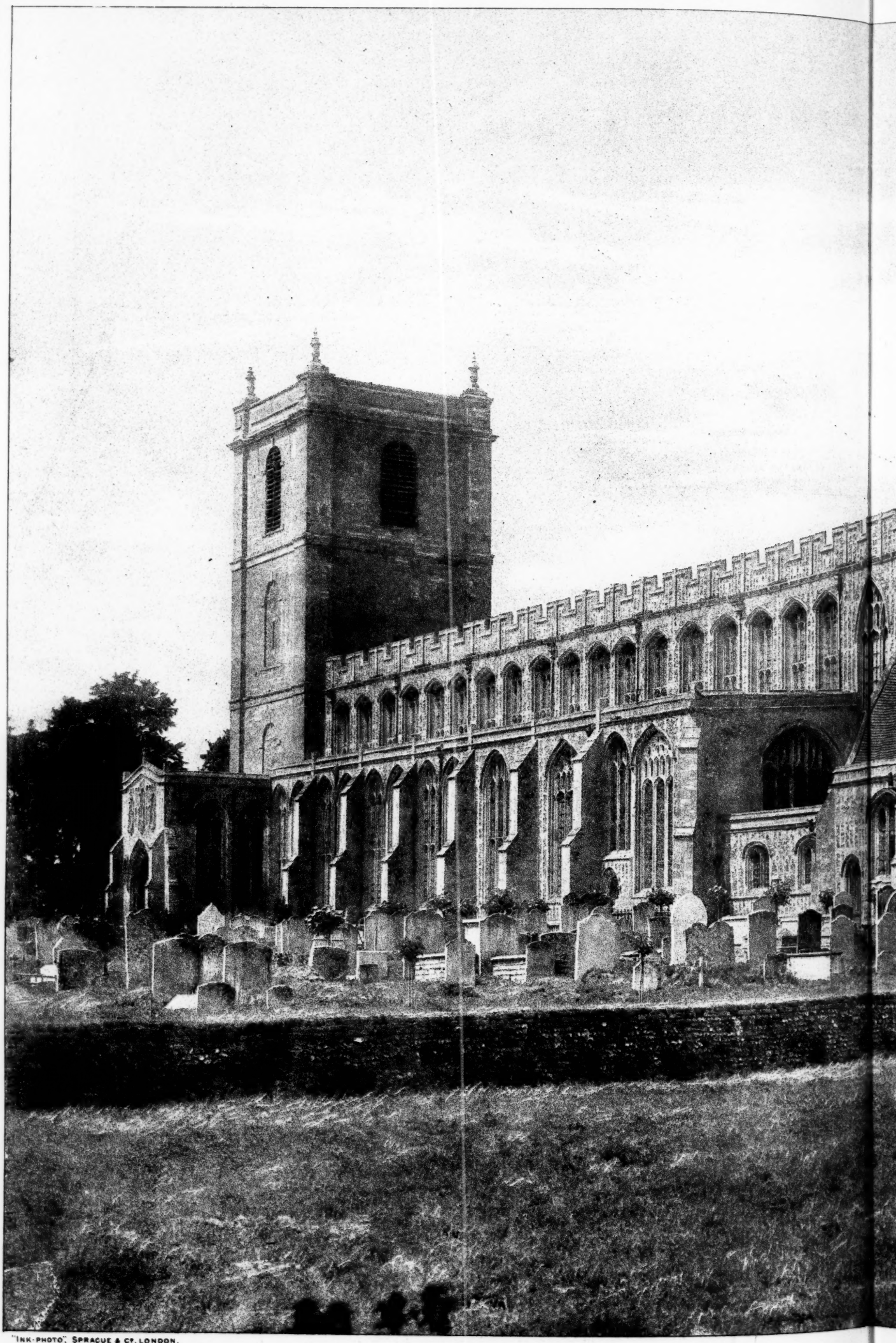
20. 10. 0. 10.

SCALE OF FEET.

Vincent Brooks, Day & Son, Lith.

Wyman & Sons, Printers.

THE "MILLER" MEMORIAL HOSPITAL, GREENWICH.—MESSRS. KEITH D. YOUNG & HENRY HALL, ARCHITECTS.

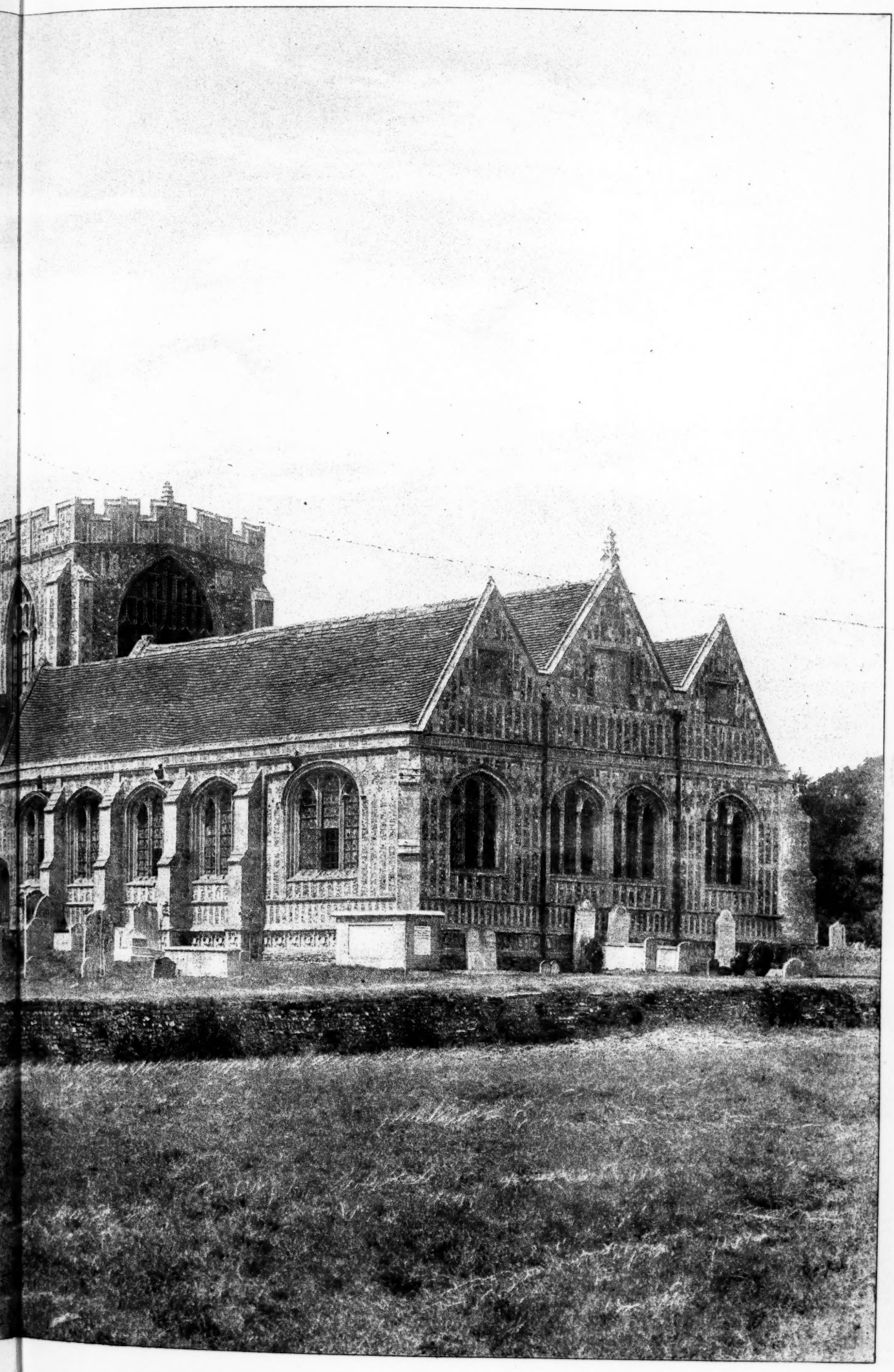


"INK-PHOTO", SPRAGUE & Cº. LONDON.

LONG MELFORD (HUR

VISITED BY THE ARCHITECTURAL ASSOCIATION ON TH

From a Photograph by Mr Panton



D CHURCH, SUFFOLK,

ON THEIR ANNUAL EXCURSION, AUGUST, 1884.

Mr. Panton, Bury St. Edmunds.

THE SUMMER MEETING OF THE INSTITUTION OF MECHANICAL ENGINEERS.

A most successful summer meeting of the above Institution has just taken place at Cardiff. The members having been formally received by the mayor of Cardiff (Mr. Robert Bird), the President of the Institution, Mr. I. Lowthian Bell, F.R.S., gave his inaugural address. Taking "Iron" as his subject, he gave a short historical sketch as to its development into the various forms in which it is now produced, remarking on the great service rendered by mechanical science to the art of iron-making. Referring to the Bessemer process, he said it had revolutionised the means of obtaining iron in its malleable form; the product was purer, and the cost of conversion was less than that obtained by means of the puddling process. In the manufacture of Bessemer steel it was found advantageous to blow the metal until the bath, so far as metalloids were concerned, became malleable iron. The addition of a substance containing a readily oxydisable metal, such as speigel-eisen or ferro-manganese, carried off the superabundant oxygen, at the same time that it restored sufficient carbon to give steel any desired degree of hardness or softness down to what, in the matter of carbon, must be regarded as malleable iron. The President next referred to the great superiority of iron over wood for shipbuilding, and to the introduction of steel into the construction of locomotives, and his interesting address was brought to a conclusion by some practical remarks on the subject of foreign competition and the labour question.

The Secretary then read a paper by Mr. J. M'Connochie "On Recent Extensions of Dock Accommodation and Coal-Shipping Machinery at the Bute Docks, Cardiff." These docks were visited by the members during the afternoon, and the various machines were seen in operation. First amongst these was the movable hydraulic crane for rapid coal-loading, constructed by Sir W. Armstrong, Mitchell, & Co. The chief novelty in this is Westmacott's coaling cradle, which may be described as a light platform suspended by chains, which takes its seat on an ordinary line of rails in any position. It is suspended on what may be called an anti-friction swivel, which enables a man to turn the cradle with a loaded wagon on it, thereby dispensing with turntables. Referring to the crane itself, the turning of the pillar and jib is effected by a pair of hydraulic cylinders, one on each side of the pillar, fixed to the base of the pedestal, which remains stationary. The chain from these cylinders passes round a drum at the foot of the pillar. All the motions are controlled by one man in a valve-house on the side of the pedestal. The pressure water is conveyed to the crane by movable and jointed pipes, which can be attached to hydrants placed at convenient distances on hydraulic mains along the quay walls. In actual work, it is found that with this crane a wagon of coal can be shipped in from two minutes and a half to three minutes; in fact, it must be held that, from an engineering point of view, the coal-shipping machinery is by far the most advanced and interesting thing to be seen in or near Cardiff.

The pumping machinery employed for discharging the water from the public graving dock consists of two centrifugal pumps, each working in a separate circular well and driven by a high-pressure horizontal engine and four lift-pumps, all fixed in one square well and driven by a direct-acting condensing engine.

On the second day the papers read were "Petroleum as a Fuel for Locomotives," by Mr. Thomas Urquhart, from Russia; and "Corrosion in Marine Boilers," by Mr. J. Harry Hallett, of Cardiff. Both of these were of a purely technical character, but we may add that for the prevention of corrosion Hannay's "Electrogen" was well spoken of. During the afternoon the members visited by special train some of the chief collieries in the neighbourhood, including the Great Western, Lewis's Merthyr, Cymmer, and Llwynypia. At the Great Western Colliery the underground haulage is done by means of compressed air, and steam is supplied to the air-compressor from the boilers, which are fired by the waste gases from fifty Coppée coke ovens. The pit is ventilated by means of a Guibal fan, 40 ft. diameter, and a Schiele fan is now being erected. The pit is 400 yards deep and equal to an output of about 1,200 tons per day. At the Lewis Merthyr Pit a Schiele fan is used for ventilation, and Sheppard's coal-washing machine and crushers are used.

On the third day an excursion was made to the great ironworks of Dowlais and Cyfarthfa, passing on the way Pwllypant Quarries, from which most of the walling stones of the Bute Docks have been obtained. The Dowlais works employ nearly 10,000 hands. At the steel works there are six Bessemer converters and two blowing-engines, capable of producing some 5,000 tons of steel per week. There are also six Siemens furnaces; two steel-rail mills, rolling about 2,500 tons per week; and a large number of furnaces, puddling-forges, and bar-mills. One of the chief features of interest was a recently-erected coal-washing machine (Luhrig's patent), capable of washing 1,000 tons of coal per day. The cost of this machine, we are informed, was over 20,000*l*.

A number of the members visited the Penarth Docks during the day, and the very fine masonry in them was the subject of general remark. The blasting and dredging operations were also witnessed.

A *conversazione* at the Cardiff Free Library took place in the evening, when the Menelaus pictures and a choice collection of books and engravings were inspected.

On the fourth day various tin-plate and iron and other works were visited, and on the last day a visit was paid to the Severn Tunnel works, Portskewett, when the system of boring pursued and other operations were fully explained.

Some further particulars of the Dowlais and Ebbw Vale Works, which were visited during the week, as already mentioned, may be of interest.

The Dowlais Works.

The Dowlais Iron Works were founded in the middle of the last century, now very nearly 140 years ago. In the present day they present indications of their antiquity, although we believe all relics of their most primitive days have disappeared. Dowlais has always been energetically conducted, and, owing no doubt greatly to cheap labour and unlimited space, has been able to meet the competition of the more modern establishments further north. It is, perhaps, largely owing to the two economic features referred to that iron puddling is being still carried on here, apparently with fairly successful results. The Dowlais works can, however, claim an important place in the record of progress of the iron and steel industry, for it was here that the first steel rail was rolled, the plant by which it was produced being still in use. The works are divided into two parts, known as the old works or Dowlais proper, and the new or Ivor Works. On the occasion of the last visit of this Institution to Cardiff, just ten years ago, one of the Ivor furnaces had just been started, and was then getting into full blast. It was served by a Whitwell stove for heating the blast, an apparatus that was then looked on with more interest than at present, as fire-brick stoves, either on the Whitwell or Cowper principle, have become far more common during the last decade, and are now fast superseding the old pipe stoves, which will not heat the blast to a sufficient temperature for modern requirements. At the present time we believe four furnaces are in blast at the Ivor Works, whilst six are working in the older part of the establishment, which, however, contains the more modern appliances.

The Dowlais furnaces will not compare in size with the modern giants of the northern districts or with those of the United States, still a notable increase in height has taken place in South Wales since coke alone has been used as fuel. The largest furnaces at Dowlais at present in blast are between 65 ft. and 70 ft. high, and have boshes 17 ft. 6 in. in diameter. The hearths are 7 ft. 6 in. across, and the tops 12 ft. 6 in. These are cylindrical furnaces, and are bound with iron bands in place of having the outer casing of sheet iron, usual in cupola furnaces in other districts. Another furnace of the same description, but 10 ft. higher, is now all but completed, and will, no doubt, be shortly blown in. The blast for these furnaces is heated by either Whitwell or Cowper stoves, and it is indicative of the growing popularity of hotter blast that several cast-iron pipe stoves are rapidly being dismantled in this part of the work. Perhaps it is as well here to mention that the Cowper stoves are composed of a casing of sheet iron, which is lined with fire-brick. Within this is a chequer-work mass of fire-brick. The waste gases from the furnaces are carried to the bottom of the stoves by a suitable tube, and then pass to the top by means of an internal flue, at the bottom of which are inlet valves. Through these air is admitted in order to complete the combustion of the gases. The latter having passed to the top of the stove find their way down through the interstices of the chequer-work, and finally escape to the main chimney-shaft. When a stove has become sufficiently heated for the purpose the gases are shut off, and the blast from the blowing-engine, which is required to urge the combustion in the blast furnace, is caused to pass through the chequer work in an opposite direction to that taken by the flame, and will naturally become heated by contact with the perforated fire-brick mass. It will be seen that the stoves are intermittent in their action, at one time being heated and at another giving forth the heated blast. The Whitwell stove differs from that described, chiefly in the manner in which the heating surface of fire-brick is arranged, but both work on the regenerative principle above explained. With these appliances the blast is sometimes brought to a temperature of over 1,400 degrees Fahr., which it would be practically impossible to obtain with the old cast-iron stove. In the latter apparatus the waste gases are brought in contact with iron pipes through which the blast is urged, or else they are heated by special furnaces contained in them, in which coal is burned. The blowing-engines at the Dowlais works are mostly of the beam-engine type. The largest is a compound beam-engine with steam cylinders, 42 in. and 60 in. in diameter, and a stroke of 10 ft. The blowing-cylinder is 12 ft. in diameter. The boiler pressure is 50 lb., and the pressure of blast about 3½ lb. per square inch.

Steel is made at Dowlais both by the Bessemer and Siemens-Martin system. There are three Bessemer pits of the ordinary sunk type, each having two eight-ton converters. This plant has been laid down for some time, and does not call for any special notice. The six Siemens-Martin furnaces will work with from six to eight ton charges. There are two furnaces to a pit. The rolling-mills are placed conveniently to the furnaces. In this part of the works a fine pair of engines, to drive a new rail-mill, are being erected. These have been supplied by Messrs. Kitson & Co. This, we understand, is the first instalment of considerable changes that are about to be made at Dowlais, the management having determined to keep in the van of progress. There are the usual coke ovens, coal-washing machinery, and repairing-shops seen on works of this character, but which it would be useless for us to attempt to deal with in the space at our disposal.

The Ebbw Vale Works.

These works are also of large area, extending for some considerable distance up the valley of the Ebbw. They were founded late in the last century by a Staffordshire iron master. For many years members of the well-known family of Harford were proprietors, and in 1844, about a century after Dowlais was started, Mr. A. Darby purchased the works, which he enlarged considerably, and for many years he carried on a highly successful trade under the style of A. Darby & Co. Just twenty years ago the enterprise was converted into a limited company as it now exists.

The company are lessees of nearly eleven thousand acres of freehold and leasehold mineral property. During last year their output of coal from the various collieries connected with the establishment was close upon one and a half million tons. The coke made amounted to over a quarter of a million tons, whilst nearly six million bricks were manufactured on the premises of the company. The production of iron and steel during last year in pig-iron and speigel-eisen was 212,412 tons; and 131,780 tons of finished iron and steel, in the shape of rails, bars, angles, &c., were produced.

The Ebbw Vale blast furnaces are of the same type as those at Dowlais, being of cylindrical form, and hooped with iron bands. There are at present six in work, four are situated at the northern end of the works, and two others at the extreme south, or a distance of about a mile and a half apart. They have mostly Cowper stoves (three to each furnace), although there are one or two old pipe stoves still in use. The steel works are about half-way between the furnaces, and contain three Bessemer pits of the usual form, having two

eight-ton converters apiece placed on opposite sides. The metal, which is tapped from the blast furnaces is brought, in the case of the north furnaces, for about three-quarters of a mile. This seems a considerable distance to bring a ladle of molten iron, but is somewhat less than that at Barrow, where the furnaces are over a mile from the steel works. This distance, however, was far exceeded at the Ebbw Vale, when the Company had the Sirhowry furnaces at work. These are situated about seven miles from the steel works, and the ladle containing the charge of metal used to be brought that distance by railway, and the molten iron was then run into the converters. There are two fine pairs of blowing engines for these converters, one by Messrs. W. & J. Galloway & Sons, and the other by Messrs. D. Adamson & Co. The maximum pressure of blast used is 25 lb. to the square inch. There is also in the same engine-house a set consisting of three pairs of very fine hydraulic pumping engines, by Sir W. G. Armstrong & Co. These are used for the hydraulic cranes and hoists required in the Bessemer plant. The rolling-mills attached to these converters have eight Siemens gas-fired heating-furnaces, which are worked by hydraulic gear for withdrawing the ingots. The blooming rolls are 36 in. between centres, and are driven by a pair of 36-in. cylinder engines, geared 3 to 1. These are by Galloways, of Manchester. The mill-train has rolls with 30-in. centres, which are driven by a pair of vertical engines with 50-in. cylinders, geared 1½ to 1. The Victoria blast-furnaces, which are placed at the southern end of the works, are modern and well-designed erections. The blowing-engine house is a handsome and solidly-built structure, and contains two fine vertical engines, with blowing-cylinders 100 in. in diameter, by Messrs. Kitson, of Leeds. The gases from the furnaces are used for heating the steam-boilers supplying these engines. There are extensive ranges of coke-ovens on the high ground above the furnaces. The majority of these are on the Coppée principle, and are discharged by the charge being pushed out by steam machinery. The oven is simply a long straight tunnel with a door at each end. Both doors are opened and the "pusher-out" clears the whole contents. In the ordinary "drag-oven" the coke is dragged out by means of an iron bar which is placed on the floor of the oven before the charge is put in. In the latter the coke is watered in the oven, and this is said to have the effect of driving out a good deal of the sulphur; however this may be, the ordinary oven coke is a better colour than that of the Coppée ovens. The advocates of the latter affirm that the difference between the two cokes is mainly one of appearance, and that if Coppée coke be watered immediately it is pushed from the oven there is very little practical difference. It is perhaps worth notice that in the South Wales district, when coke is produced for immediate use, as at ironworks, and not for sale, the Coppée ovens are, as a rule, in strong favour. On the other hand, at the collieries, where the coke is made to be sold, drag ovens are the rule. At only one colliery did we notice Coppée ovens, and this was in a case where the bituminous vein had been exhausted and a coal only slightly bituminous was being worked. Coppée ovens are especially well adapted for coking harder coals. We believe that these ovens were first built on an extended scale at Ebbw Vale. There are two or three other rolling-mills at Ebbw Vale. A bar-mill, with a 12-in. train, is now being erected. This is to be driven by cotton rope, which is a new departure in rolling-mill practice. In the same building there is an 18-in. train. In another building a 36-in. train is in progress, in which some novelties are being introduced in the shape of hydraulic turning-over gear. There are extensive foundries, engine-fitting and erecting shops, smiths' shops, wood-working shops, and many other buildings of this description, the extent of which will be understood when we say that the Company make all their own rolling-mills and plant of this description, and many of the larger engines for working them. The thirty-two locomotives and 3,500 trucks owned by the Company are all kept in repair on the premises.

Designs Competition, Dairy Show, 1884. The Secretary asks us to remind our readers that entries for the above close on the 25th inst.

FURTHER NOTES AS TO VENTILATING APPLIANCES AT THE HEALTH EXHIBITION.

In the Central Annexe, between the Central Gallery (Science and Art) and the gardens, a number of ventilating appliances and arrangements are shown, either full size, or by means of models and drawings. At Stand 687 Messrs. George Wright & Co., of Westminster Bridge-road, show a model of their "Eclipse" ventilator for billiard and smoking rooms, which is designed for carrying off not only the products of combustion from the gas-burners, but the foul air from all parts of the room. Stand 688 is occupied by Messrs. Sharp & Co., of Holborn-viaduct, with their "Crown Ejector" ventilators as applied, not only to buildings, but to yachts. The same firm are exhibitors of soil-pipe ventilators and air-inlet brackets, some of them in the form of capitals, so as to work in with the architectural features of interiors. They also show a new corona reflecting gas-burner. Messrs. Dick Radclyffe & Co., of Holborn, exhibit at Stand 690 some ventilated window-cases for ferns, flowers, &c. At Stand 691 is shown a model of a ventilating window-sash and frame, invented by Mr. Augustus Frere, F.R.I.B.A., with a view to the requirements of the dwellings of the poor, though it is capable of wider application. At Stand 692, Messrs. H. W. Cooper & Co. (Limited) have a very good display of their specialities in perforated, louvred, and sliding glass ventilators, with some excellent weather-tight metal casements of improved construction. The way in which both the perforated and the louvred ventilators are combined with coloured glass windows is worthy the attention of visitors. An improved hopper ventilator for skylights shown at this stand is especially worthy of note. Dr. P. W. Perkins Case, of Croydon, shows at the next stand (693) a sash-regulating ventilator, combined with a shelf which turns up or down as desired. Another method of billiard-room ventilation is shown by a model at Stand 694. It is exhibited by Mr. George W. Webb, A.R.I.B.A., of Reading, who claims to have achieved the task of automatically removing in the most direct manner the products of combustion, tobacco-smoke, &c., and of supplying fresh air without down-draught. Mr. George Fellows Harrington, of Ryde, I. W., exhibits (Stands 696 and 720) his system of sewer ventilation by means of shafts rising above the houses, the street ventilating gratings, such as those used in London and other towns, being abolished. Although there is much to be said in favour of such a system as that advocated by Mr. Harrington, its adoption would necessitate precautions which would not always be observed. There is considerable difference of opinion on this subject, but we are strongly inclined to think that the preponderance of the argument is in favour of the London method, properly carried out. Mr. B. Hainsworth (Stand 697) shows his "double-current syphon dormer ventilator," and other ventilators on the same principle. Stand 699 is occupied by Messrs. John Smeaton & Sons, of Ludgate-circus, who show the "Kosmos" ventilators, of which a large one is exhibited in action. In this ventilator a small stream of water is made to impinge upon the periphery of a wheel, which is made in the form of a brush, and so sets in motion a series of revolving blades or fans. At Stand 700 Mr. Edward Wood, of Red Bank Works, Manchester, exhibits what are known as "Tobin's" tubes. Messrs. William Udal & Co. (Stand 701) exhibit Bruce's patent fanlight opener, a simple and effective apparatus which we believe we have noticed with commendation on some former occasion. Lieut.-Col. Thorneycroft, of Tettenhall, exhibits a model of his house, the sanitary arrangements of which were fully described and illustrated in the *Builder* a few years ago, under the title "A Notable House." Mr. W. W. Nicholls (Stand 703) is the exhibitor of a safety window-frame and sash of which we spoke favourably a few weeks ago (see *Builder* p. 82, *ante*). At Stand 706 Dr. R. Neal shows his chemical punkah and chemical "lung" for fixing in rooms for the purification of the air. The lung consists of an endless perforated webbing which is made to pass over top and bottom rollers,—the bottom roller being fixed in a trough containing a solution of caustic soda, through which solution the fabric passes, and thus is obtained a considerable surface charged with a material which absorbs and destroys noxious gases. At Stand 710 Messrs. Hayward Bros. & Eckstein, of Union-street, Borough, are exhibitors of Boyle's patent mica-flap outlet ventilators, and the Sheringham inlet ventilators, to be used in conjunction. These ventilators have been largely adopted for many years, and with the best results. The same exhibitors also show their "semi-prism" pavement-lights, the free use of which will bring daylight into corners to which it has not penetrated for years. Messrs. Josiah Moore & Sons, of St. James's-walk, Clerkenwell, exhibit (Stand 712) their improved glass louvre ventilators, as well as circular and sliding glass ventilators in various forms; they are too well known to need description or comment. Stand 713 is occupied by Messrs. Harcourt Thompson & Co., who show their ventilating ridge, and a new mercurial air-valve, which opens or closes according to the rise or fall of the temperature of the room in which it may be fixed. At Stand 714, Messrs. Meakin & Co., of Baker-street, show their self-acting sash-fastener and opener, which for security, efficiency, and ease of working, are unsurpassed. The "Standard Sliding-sash," shown by these exhibitors, allows of the outside of the glass being cleaned by a person standing on the floor of the room, and in case new sash-lines are required there is no necessity for removing any fixed parts. Mr. W. P. Buchan, of Glasgow (Stand 715), shows his patent ventilating cowls and a model of a house ventilated on his system, by which provision is made for removing the products of combustion from every gas-burner, and for supplying air direct from outside to assist the combustion in the fireplaces. Mr. J. E. Ellison, of Leeds (Stand 717), shows his conical perforated brick ventilator, his patent radiator ventilator, and Stevens's chimney-tops and soil-pipe cowls. We have on previous occasions spoken of the efficiency of Mr. Ellison's ventilators. Messrs. J. M. Lamb & Co. (Stand 719) show their "Triumph" centrifugal air-pump exhaust ventilators, and their patent "Outer-section" fixed cowls, together with other appliances, all of which appear to merit the careful attention and examination of visitors. Particularly worthy of mention is a noiseless fan, which is shown in action in the Machinery in Motion Department. Messrs. C. Kite & Co., of Christopher Works, Chalton-street, N.W., occupy Stand 721, and exhibit their exhaust and inlet ventilators, and a model showing their application. Some of these, we believe, have been used in the Sanitary House at the Exhibition. A model of a house illustrating Messrs. Kite's system is exhibited by them. Their roof ventilators have lately been used for new Board Schools at Warwick. Particularly worthy the attention of householders is Kite's noiseless chimney-breast outlet ventilator, which is easily fixed, and, apparently, judging by tests we have witnessed, very efficient. The wall-inlet ventilators shown at this stand also deserve attention. These, or some similar appliances (we refer both to the wall-inlet ventilators and to the chimney-breast ventilator), should be fitted in every dwelling-room, especially where gas is burned. Stand 723, that of Messrs. Ewart & Co., of Euston-road, contains specimens of the "Empress" ventilator (of which we have on previous occasions spoken favourably) and the "Prince" chimney-pot. Mr. W. Lord, of Middlesbrough (Stand 724), shows his patent "Incline" chimney-cowl, which is fixed, and consists of a number of cylinders, on each of which are fixed six or more inclined channels or passages, and it is claimed that the action of the wind on these creates a powerful centrifugal motion up the interior of the cowl, and so assists its extractive power and prevents down-draughts.

In the Western Gallery (Machinery in Motion) Messrs. A. W. Kershaw & Co., of Lancaster, exhibit, at Stand 1,181, their patent pneumatic exhaust ventilators as applied to buildings, ships, and yachts. These appliances are used in conjunction with down-cast ventilators, and the system of ventilation thus obtained appears to be very efficient, and devoid of down-draught. These ventilators have, we are informed, been adopted at the Manchester, Sheffield, and Lincolnshire Railway Company's new offices at Manchester.

The New Burial-ground at New Brentford was consecrated on the 13th inst. by the Bishop of London. The chapel and other works have been erected from the designs of Mr. Chas. J. Gladman, A.R.I.B.A.

INTERNATIONAL INVENTIONS EXHIBITION, LONDON, 1885.

We acknowledged last week the receipt of the prospectus of this Exhibition, which is to be opened in May, 1885, in the buildings now devoted to "The Healtheries." We now give some further particulars.

Division I. (Inventions) will include groups of apparatus, appliances, processes, and products, invented or brought into use since 1862, relating to:—1, Agriculture, Horticulture, and Arboriculture; 2, Mining and Metallurgy; 3, Engineering Construction and Architecture; 4, Prime Movers, and Means of Distributing their Power; 5, Railway Plant; 6, Common Road Carriages, &c.; 7, Naval Architecture; 8, Aëronautics; 9, Manufacture of Textile Fabrics; 10, Machine Tools and Machinery; 11, Hydraulic Machines, Presses, Machines for Raising Heavy Weights, Weighing, &c.; 12, Elements of Machines; 13, Electricity; 14, Apparatus, Processes, and Appliances connected with Applied Chemistry and Physics; 15, Gas and other Illuminants; 16, Fuel, Furnaces, &c.; 17, Food, Cookery, and Stimulants; 18, Clothing; 19, Jewellery; 20, Leather, &c.; 21, India-rubber and Guttapercha, &c.; 22, Furniture and Accessories,—Fancy Goods; 23, Pottery and Glass; 24, Cutlery, Ironmongery, &c.; 25, Fire-arms: Military Weapons and Equipment, Explosives; 26, Paper, Printing, Bookbinding, Stationery, &c.; 27, Clocks, Watches, and other Timekeepers; 28, Philosophical Instruments and Apparatus; 29, Photography; 30, Educational Apparatus; 31, Toys, Sports, &c.

We give the detailed classification of one or two of the Groups:—

Group III.—Engineering Construction and Architecture.

Class 13. Roads.—Methods and materials for constructing and paving roads; cleansing roads and pavements; road-sweeping machines; rollers; apparatus for the removal of mud, snow, &c.; water-carts and other means of watering.

Class 14. Railways and Tramways.—Construction; excavators and appliances used for earth-work and tunnelling. Permanent way: rails, chairs, sleepers.

Class 15. Bridges and Viaducts.—Models, plans, and designs for arched, girder, suspension, trestle, and other bridges; apparatus used in construction.

*Class 16. Docks and Harbours.—Models, plans, and designs for docks, harbours, piers, breakwaters, &c.; submarine constructions; diving apparatus; dredging machines; pile-drivers, screw piles; coffer-dams; graving docks, "patent" slips, caissons, pontoons, floating docks, hydraulic apparatus for working dock-gates, &c., gridirons. Buoys.

*Class 17. Lighthouses.—Method of construction; appliances used in lighthouses and in lightships, fixed and flashing light apparatus, lamps, sound signalling apparatus.

Class 18. Rivers and Canals.—Conservation and improvement of rivers; construction of canals; locks, lifts and inclines, weirs.

*Class 19. Water Supply and Sewerage.—Methods of collecting, pumping, storing, filtering, and distributing water; appliances for detecting and preventing waste of water, water-meters; water fittings, filters; sewers, sewage disposal and utilisation.

Class 20. Reclamation, Irrigation and Drainage of Land. Drainage (natural and artificial) of low-lying districts; embanking and warping land; irrigation works.

Class 21. Testing Apparatus.—Apparatus and instruments used in testing iron, stone, brick, concrete, cement, &c.

Class 22. Military Engineering and Fortification.—Military topography.

*Class 23. Materials used in Building.—Bricks and tiles, machines for making them; concrete, artificial stone, cement, materials and appliances used in their production; asphalt; roofing felt, and other roofing materials; columns, girders, and other applications of metal in building; application of terra-cotta to buildings; preservative and fire-resisting materials, paints, &c., for application to stone, wood, iron, &c.; methods of applying the same.

*Class 24. Building Construction.—Models and plans showing methods of construction; non-combustible constructions; labour-saving and other machines and appliances used in building, scaffolds, elevators; fittings and appliances used in buildings, shutters, blinds, lifts, bells, speaking-tubes, &c.

Class 25. Heating, Ventilation, House-drainage, &c.—Sanitary appliances; ventilators; cowls for chimneys, chimney-sweeping apparatus; apparatus for heating by steam, water, air, &c.; means of cooling air.

Group XXIII.—Pottery and Glass.

Class 119. Kilns and Furnaces.

Class 120. Bricks, Tiles, Earthenware, &c.—Terra-cotta; architectural pottery; fire-clay goods; crucibles; drain-pipes; chemical and similar stoneware; materials, machinery, and apparatus.

Class 121. Porcelain, Majolica, and Artistic Pottery.—Biscuit-ware, faience; Parian; materials, machinery, and apparatus.

Class 122. Crown, Sheet, and Plate Glass.—Window glass, mirrors, stained glass; glass mosaic; materials, machinery, and apparatus.

Class 123. Bottles, Table Glass, Toughened Glass, &c.—Materials, machinery, and apparatus.

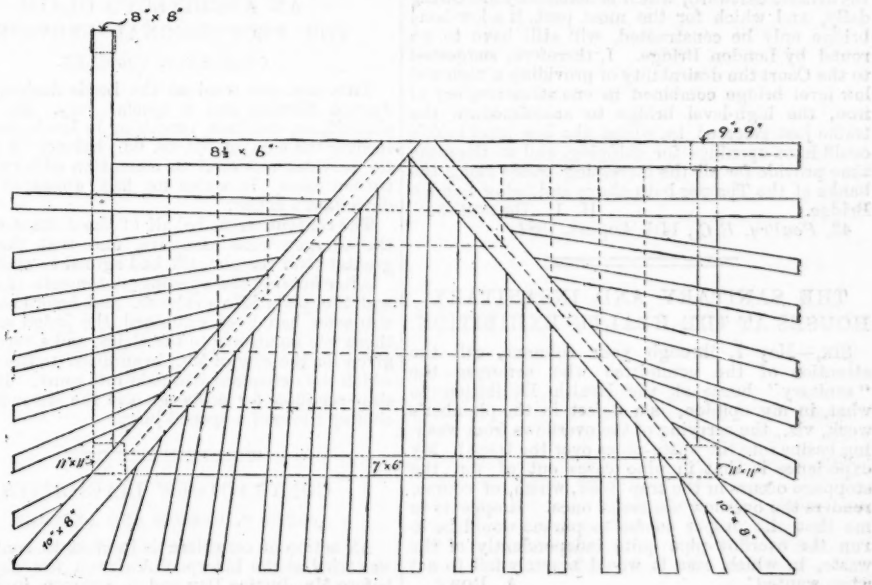
Division II. (Music), is intended to include three groups, viz., XXXII., Instruments and Appliances constructed or in use since 1800; XXXIII., Music Engraving and Printing; and XXXIV., Historic Collections. But, as we suggested last week, and as will be seen by the foregoing details, the first division, Inventions, includes such a plethora of subjects, that it appears to be questionable whether adequate justice can be done to Music,—a large subject in itself, but which is not even mentioned in the title of the Exhibition.

Applications for space must be sent to the Secretary (from whom further particulars may be had) not later than the 1st of October. Applications from foreign countries and the colonies will be received up to the 1st of November.

* Having in view the wide range of this International Exhibition, and the limited nature of the total available area, it will be necessary to restrict as much as possible the amount of space which can be allotted even to the most important classes; and only under exceptional circumstances can applications be entertained for space for objects which have been shown in the Smoke Abatement Exhibition, 1881; the Fisheries Exhibition, 1883; or the Exhibition of Health and Education of the present year. The classes including such objects are marked in the classification with an asterisk.

CURIOUS FLOOR CONSTRUCTION.

Sir,—I enclose herewith a sketch of the construction of a floor, which I think is peculiar and unusual. It occurs in a very old house situate in King-street, in this town. As the sketch shows, the joists are laid so that they almost appear to radiate from a common centre, and they are mortised into two large beams which cross the house diagonally, from the



angle of the wall to the centre of the partition-wall against the next house. The method of laying the floor-boards is also peculiar; they are of great width, and mitred over the line of the last-named beams. The first floor overhangs from the girders supporting the joists. The dotted lines represent the floor-boards.

There is one other house with a similar construction within a few yards of this one, and evidently of the same date.

R. G. Carpenter.

Duppas House, Croydon, Aug. 7th, 1884.

THE GUEST-CHAPEL, CROXDEN ABBEY, STAFFORDSHIRE.

Sir,—May I ask you to help those who are striving to obtain the preservation of the thirteenth century Guest-chapel of the Cistercian Abbey of Croxden? I learn on the best local authority and from Mr. Loftus Brock that it is proposed, with the consent of the owner of the Abbey lands, Lord Macclesfield, to remove this chapel and to erect on its site a new church, and that already its roof is removed and that its total disappearance rests on the decision of his lordship.

I must explain that in the middle of the eighteenth century the chapel was altered and repaired and re-roofed to do duty as the church of the little village grown up amongst and around the Abbey ruins. This beautiful thirteenth century ruin seems to be but little known, although not more than three or four miles from the railway stations of Rocester and Uttoxeter. The late Mr. Street knew and much admired it, and I have frequently visited it and sketched and measured its pure and beautiful detail.

I need not point out to those who have studied the Cistercian plan, such as Viollet-le-Duc gives, that a Guest-chapel formed an essential part of it, as it did, too, in the earlier Benedictine foundations.

We have not many examples of guest-chapels. The well-known one at Canterbury, now the chapel of St. Augustine's College, will occur to most of us, so beautifully reclaimed from the most degrading uses and restored for Mr. Beresford-Hope by Butterfield. Croxden Chapel never sank to this depth. Surely the old chapel might be retained, even as a ruin, as it was left by the Reformers, and the new church erected near it; or the chapel might be re-roofed and used as a parish room. Anything rather than destruction! It is true that the interior and the arrangements are squalid and mean, just as so many of our rescued churches were not many years ago, and that a new and proper church is required, but surely not at such a sacrifice.

The chapel is an oblong, with three south and one east lancet, and remains of south and west doorways. The lofty narrow lancets have bold chamfers and internal arches just as the rear western and southern windows of the Abbey Church close by. Its walls are built with red and grey sandstone blocks, as the church. In fact, it is part of one design by the original Cistercian architect. The interior walls have several coats of painted or tempera decoration, the first being on the stone.

Although there is no detail of such beauty as in the chapter-house entrance, the chapels, and other portions of the church and buildings, this chapel, in its harmonious simplicity, is characteristic of one well-thought-out design. Mr. Loftus Brock has in his possession a beautiful set of drawings of the chapel executed by a friend, which he would, I am sure, be happy to show to those interested, and who would be willing to help.

I cannot believe that the advocates of the destruction of the chapel do appreciate its architectural and archæological interest (for there is a tradition that the building is comparatively modern, using up old stones). Many of those in the neighbourhood value it, however, and its destruction would be a grievous loss to them and to many of us.

H. Herbert Carpenter.

August 19, 1884.

THAMES COMMUNICATIONS.

Sir,—Your issue of the 9th inst. contained a paragraph on this subject, in which my name is mentioned as having voted at the last Court of Common Council against a proposed addition to the Bridge House Estates Committee's recommendation, which addition was to the effect that the Corporation should publicly advertise for designs for the new bridge, whilst three other architects who were present and took part in the proceedings voted with him. This statement, sir, scarcely does me justice.

The facts are as follow:—The Bridge House Estates Committee recommended that a new low-level bridge be constructed across the Thames at the Tower, whilst a strong feeling in favour of a subway existed.

The debate was continued at a special court convened for the purpose, the result of the division being 83 for the bridge and 58 for the subway, two

or three of the architects named voting in the minority.

Mr. Peebles then proposed his amendment to the Committee's recommendation, which gave a general impression to the majority that the object was a postponement for another year, and as I was, like Mr. Peebles, strongly in favour of a bridge, I represented to him the possibility of his amendment achieving the object of the minority at the same time adding that the chairman of the Committee had pledged his word to me that there would be an open competition for designs.

This assurance of the chairman I plainly saw would also have satisfied Mr. Peebles, as it did myself, but for a division having been called for by other members of the Court. Having such a pledge from the chairman, I considered I could confidently stand by the Committee's recommendation to the end, not knowing, of course, how other architects were going to vote. I must, therefore, not be judged as unfavourable to an open competition for so important a matter as a bridge across the Thames within the City of London; but I am afraid, without this explanation, a wrong interpretation will be given to my vote. Whilst on this question of Thames communication, I would add that, although I consider a bridge to be far preferable to a subway, I do not for a moment think that a low-level bridge will meet all the requirements of the case.

The proposed new street from King William-street *vid* the Monument to Thames-street, about to be constructed by the Commissioners of Sewers at a cost of 300,000*l.*, points to the absolute necessity of an outlet across the river for the low-level traffic; still, I am satisfied it will be a great mistake to altogether overlook the high-level traffic in and about the newly-constructed Eastcheap, the Tower, and the district eastward, which is manifestly increasing daily, and which for the most part, if a low-level bridge only be constructed, will still have to go round by London Bridge. I, therefore, suggested to the Court the desirability of providing a high and low level bridge combined in one structure, say of iron, the high-level bridge to accommodate the traffic just referred to, whilst the low-level bridge could have openings for shipping, and at the same time provide for all the increasing traffic along the banks of the Thames both above and below London Bridge.

H. H. Bridgman.

42, *Poultry, E.C.*, 14th August, 1884.

THE SANITARY AND INSANITARY HOUSES AT THE HEALTH EXHIBITION.

Sir,—May I, through your columns, call the attention of the committee who arranged the "sanitary" house at the Health Exhibition to what, in my opinion, is a defect in the plumber's work, viz., the carrying of the overflows from washing basins into the waste-pipes over the traps? My experience is that in nine cases out of ten the stoppage occurs in the trap itself, which, of course, renders the overflow useless at once. It appears to me that the proper course to pursue would be to run the overflow-pipe quite independently of the waste, in which case it would scarcely fail to act when wanted.

A. Rowe.

A PARTY-WALL QUESTION.

THE DISTRICT SURVEYOR OF ST. GEORGE'S, HANOVER-SQUARE NORTH *v.* MESSRS. CUBITT AND CO.

On the 13th inst. Messrs. Cubitt & Co. were summoned before Mr. Newton at the Marlborough-street Police-court, at the suit of the District Surveyor, for not having complied with a requisition to carry up the east party-wall of No. 95, Piccadilly 15 in. above the gutter of that building (it being the highest building adjoining the wall,—No. 94, Piccadilly being a lower building), and also to carry up the wall above any part of the roof of No. 95, opposite thereto, and within 4 ft. of it. It appeared that the defendants were carrying up the wall solid to the level of the underside of the gutter, at which level it was surmounted by an open balustrade, with plinth and capping, the plinth being solid to 7 in. above the gutter, with a thickness of only 6 in.

Mr. Redwar, barrister, appeared for the District Surveyor, and Mr. Lewis Coward, barrister, for the defendants.

Mr. Redwar submitted that the whole of the wall in question was a party-wall, although the buildings on either side were not of the same height, and for this reason, that while by Section 3 of the Metropolitan Building Act, 1855, the separation of buildings in different occupations might at first sight seem to be the one essential characteristic of a party-wall, Section 17 imposed the additional rule that every party-wall should be carried above the roof, flat, or gutter of the highest building adjoining the wall. If it were contended that there was an inconsistency between the definition in Section 3 and the rule of construction in Section 17, he would meet that by saying that Section 3 expressly provided that the definitions therein given must yield to the meaning of the context, which in this case was that every wall, which by dividing buildings of unequal height became a party-wall, was, by force of Section 17, made a party-wall from its base to its top, since a party-wall must be carried above the *highest* building adjoining thereto. This view was supported by the circumstance that "external wall" was defined in Section 3 as "an outer wall or vertical enclosure, *not being a party-wall*"; these last words clearly pointed to the contingency of some "outer walls" or "vertical enclosures" being "party-walls." He contended that Weston *v.* Arnold (L.R., 9 Ch. App. 1,084), which decided that a wall was a party-wall for such portion of its height as it actually separated buildings, and was an external wall for the remainder of its height, did not govern the Metropolitan Building Act, as it was decided on the Bristol Improvement Acts, 1840, 1847, which contained rules as to party-walls different to those in the London Act. In the case of Knight *v.* Pursell, (L.R., 11 Ch. D., 412), in which Mr. Justice Fry treated Weston *v.* Arnold as an authority on the London Act, it was not necessery to decide the point of the *vertical* extension of a party-wall, as the case related to *lateral* extension, which stood on a different footing, being governed by the definition alone in which separation was made the test, while in considering *vertical* extension it was necessary to read Section 17, with the definition.

Mr. Newton, without calling on Mr. Coward, decided that the wall was an external wall originally, and that it had been made a party-wall by the addition of a low building on the side of No. 94, but only to the point at which it separated the adjoining buildings; above that point it was an external wall. He accordingly dismissed the summons.

Mr. Coward applied for costs, but Mr. Newton said that he would not allow costs as against a public officer who was endeavouring to do his duty under an Act of Parliament.

AN ARCHITECT'S CLAIM FOR PROFESSIONAL SERVICES.

CHORLEY *v.* CROSSLEY.

This case was tried at the Leeds Assizes, before Justice Manisty and a special jury. By it, the plaintiff, an architect practising in Leeds, sought to recover the sum of 86*l.* 5s. 6d., balance of account for services rendered in connexion with two arbitration cases, in which he had appeared in the defendant's behalf.

The contention on behalf of the defence was that the charges were excessive, and that they were greater than the plaintiff had agreed to make.

After hearing the opening statements of counsel and the plaintiff's evidence, and before any other witnesses had been examined, the judge said that there was no answer to the claim, and a verdict was given for the sum of 50*l.*, in addition to the amount which the defendant had paid into court. His lordship certified for costs against the defendant, including those of a special jury.

CONTRACTORS' LIABILITIES.

JONES *v.* HUGHES AND ANOTHER.

An action of considerable interest to contractors was tried at the Liverpool Assizes a few days ago, before Mr. Justice Day and a common jury. The plaintiff was the widow of one Owen Jones, a labourer, and she claimed damages under Lord Campbell's Act against Messrs. Hughes & Stirling, contractors, of Liverpool, on the ground that her husband had lost his life through their negligence.

The circumstances out of which the action arose were as follow:—The defendants had taken a contract to pull down and rebuild a Roman Catholic Church, called St. Mary's Church, in Liverpool. The church was built in 1844, and had to be removed to another site in consequence of the land being required for the extension of the Lancashire and Yorkshire Station. At one end of the church was a tower 18 ft. square, the walls of which were over 5 ft. thick. At the height of about 40 ft. in this tower was a floor with a trap door 6 ft. square in the middle of it. The deceased man was at work on the 27th of May with four others, demolishing the walls of this tower, which were at that time about 44 ft. high. The stones of which the tower was composed, as they were loosened, were lowered by means of a steam-crane working from the ground, and the greater portion of the mortar and other rubbish was also lowered in skips. In the course of the work, however, a considerable quantity of *débris* accumulated on the floor. The deceased stepped on this floor in order to work with greater ease in prizing away one of the stones, and after he had been standing there some few minutes the floor gave way without any warming, and the man was precipitated to the ground and killed.

At the trial it was admitted on both sides that the floor was weak, the ends in the walls being rotten, and the notching of the floor-beams at the intersections being deeper than it should have been, and, in fact, the whole construction faulty. The plaintiff contended that the defendants could have, and ought to have, discovered the weakness; while the defendants contended that the weakness was a latent one which could not have been foreseen. Evidence was gone into at considerable length upon this point, but in the result it became immaterial.

From the evidence of Mr. Edward Hughes, one of the defendants, it appeared that he did not authorise the rubbish being put on the floor, and did not know of its being put there, and further that the men themselves ought to have lowered the *débris* by the crane instead of allowing it to accumulate on the floor.

As the plaintiff's witnesses were unable to contradict this evidence, the learned judge non-suited the plaintiff, remarking that the action ought to have been brought under the Employers' Liability Act in the County-court, and that he wished he had the power to make the plaintiff's solicitor pay the costs of the defendants.

CHURCH BUILDING NEWS.

Bengeo.—Several improvements have just been effected in Holy Trinity Church, Bengeo, near Hertford, which was built more than twenty-five years since from the designs of the late Mr. Benjamin Ferrey, F.S.A. The funds at disposal then only sufficed for fittings, &c., of the simplest character to the chancel. The Holy-table has been raised on a platform and a credence-table of Corsehill stone put. An elaborate polished brass altar-rail and standards have been added, and the whole of the chancel pavement and steps re-arranged and laid with Godwin's tiles from the architect's design. New English oak choir-seats, clergy-stalls, and prayer-desks have been supplied; also a handsome pulpit, with ornamental oak superstructure and moulded Corsehill stone base. The opportunity has been taken to give more space at the easternmost part of the nave. A choir vestry has been attached to the present vestry. In the churchyard handsome oak gates and brick and stone piers have been executed to the two entrances, with an arrangement for suspended lamps over them. The contractors for the building and other works have been Messrs. Geo. Ekins & Son, Hertford; for the oak fittings to the chancel, the pulpit, and the credence-table, Messrs. White & Sons, of Vauxhall Bridge-road; for the metalwork, Mr. Gawthorp, of Long Acre. Mr. Edmund B. Ferrey, F.S.A., was the architect.

South Muskham.—The chancel of South Muskham Church, Newark, has lately been enriched by the addition of a reredos, consisting principally of coloured alabaster, divided into three canopied panels by columns of green serpentine marble. The central panel contains a cross of Irish red marble, upon pure white alabaster, the sides enclosing the "Agnus Dei" and Pelican, in white marble, upon the richly-coloured substructure. The additions to the church furniture include a handsome embroidered altar-cover, carved holy table, and tapestry side hangings. The whole of the work has been carried out by Messrs. Jones & Willis.

SCHOOL-BUILDING NEWS.

Lincoln.—The foundation-stone of the new Church schools in Bargate, St. Botolph's, Lincoln, was laid on the 19th ult. by the Rev. W. S. White, of Potterhanworth, in place of the Bishop of Lincoln, who was indisposed. The school is being erected to accommodate about 300 children. The work is being carried out by Mr. W. Wright, builder, Park-street, from designs by Mr. W. Scorer, architect, Bank-street-chambers, Lincoln.

Temple Cowley.—The Education Department having required additional accommodation for 100 children, the architect (Mr. A. Mardon Mowbray, Eastbourne) of the present school chapel was instructed to prepare the necessary plans, &c. The work has been commenced by adding on the west end of the present girls' school an infants' school, 40 ft. by 20 ft. 3 in.; an entrance porch, cloak-room, and lavatories for infants and girls; book-room, and offices. The style of the present building, Gothic of the early part of the thirteenth century, has been followed in the new part, the walling being of red brick, with blue Staffordshire brick bands and stone dressings, the roofs being slated, with red roll-ridge tiles on the top. The two school-rooms can be thrown into one for Divine service, penny readings, teas, &c., by the removal of folding-doors, which can be converted into tables, the school desks being convertible into seats, and the infants' gallery into a platform. The flooring will be formed of wood blocks on a concrete bed. Mr. A. W. Collett, of Oxford, has undertaken the contract. The chancel portion will be added later on, also the school-house.

Cambrian Archæological Society.—This Society commenced its thirty-ninth session at Bala on Monday.

The Student's Column.

HINTS FOR THE STUDY OF THE HISTORY OF ARCHITECTURE.—VIII.

SARACENIC.

AT the beginning of these articles allusion was made to certain threads of bright colour darting all over the architectural web instead of coming gradually into existence like others. Such a thread is that of Saracenic or Mahometan art, which suddenly begins, at the period to which we have now arrived, to invade the web in various directions. Being such an invasive thread, it has seemed best to become acquainted, first of all, with those styles that were invaded by it, and that is why the present arrangement has been adopted in preference to Fergusson's, who puts Byzantine at the end of his Handbook.

He classifies Saracenic architecture under the following divisions:—1. The Syrian, the earliest and most like the Byzantine of all the Mahometan styles, but of which few early specimens now remain. 2. The Egyptian, which may be called the typical style of the group, commencing at the same time and from the same originals as the Syrian, but, being practised without foreign admixture for ten or eleven centuries, it acquired a completeness, and, at the same time, an elegance greater than what is found in any of the others. 3. The Persian, a style who e origin it is difficult now to trace, but which, at its culminating point, rivalled that of Egypt in splendour, but nev er in elegance nor in true architectural propriety. 4. The Indian styles naturally form the next chapter. Their origin and history being perfectly well known, no difficulty can exist in tracing them to their source or marking their gradations, or in appreciating their beauties, which, in some respects, are nearly unrivalled. 5. After completing this survey of the Eastern styles, we return to that of Spain, a style differing so much from the others as to constitute a subject very complete in itself. 6. The last distinctive style is that of Constantinople, comprising merely those edifices which were erected by the Turks in imitation of Santa Sophia and other Christian churches of that city (Fergusson's Handbook, p. 379). There must be some very strong reason to account for such an extensive diffusion of a new religion started only 622 years after the birth of Christ, whose religion one would have thought to be sufficient for a much longer period, if not for ever. The human mind, however, seems to be insatiable, and the present day in England is not without its feverish want of change in religious matters: so we must hope that our clergy will, at all events, do their best to maintain our respect for their holy office.

According to Ramée, the seed sown by Mahomet,—or Mohammed, as his name is also spelt,—at the time of his mission in 622 A.D., called the Hejira, fell on very receptive soil in the minds of the Arabs, a Semitic race, who were persuaded that he was descended in the direct line from Ishmael the son of Abraham, and that he was sent by Allah, and that his God bore a complete resemblance to the God of the Jews.

The one temple of the faith thus founded, says Fergusson on page 383 of his Handbook, was the Kaabah at Mecca, towards which all believers were instructed to turn when they prayed. Consequently we shall find that in all the mosques,—or places of worship used by the Mahometans, Saracens, or Moslems, as they are variously called,—there is a special arrangement of space allotted for praying in the direction of Mecca. The chief object in this space is the Kibleh, a niche or recess in which the Koran (corresponding with our Bible) is kept, adjoining which is a mimbar or pulpit. There are some excellent plans to a large scale illustrating this in a paper read at the Institute by Mr. H. Carpenter in February, 1883. Indeed, this paper is specially interesting as it is about mosques which have been subsequently changed into Christian churches; just as Christian churches have been changed into mosques,—for example, our acquaintance Sta. Sophia at Constantinople,—with the usual addition, required by the Saracens, of several minarets or high towers, from the top of which the call to prayer is given, and which are an indispensable adjunct to any mosque.

Beginning with Syria, we find at Jerusalem two famous mosques, one built by the Caliph Omar, in the fifteenth year of the Hejira, and which forms part of a larger one called El Aksah, built by Abd el Malek fifty-four years later; this is illustrated by Fergusson on pages 384 and 385. The other famous mosque, the Dome of the Rock, illustrated on pages 261 and 262 of Smith and Slater's book, is, they say, the subject of keen debate as to whether this is a nearly unaltered Christian building of the fourth century or a construction of Abd el Malek (above mentioned) in the year 688 A.D. The section shows a domical building erected over a rocky cavern, the entrance to which is guarded by tents supported,—not from the ground,—but by ropes attached to the capitals of the arcade.

There is a large mosque at Damascus; it was formerly the Church of St. John, and remained for some time the joint property of Christians and Moslems, both praying together in it, or, at least, on the east and west sides of a partition run through it.

The Syrian mosques are interesting to Englishmen from their connexion with the Crusades, or wars fought against the Saracens on behalf of the Christian cross (*crux, crucis*).

Taking the next country, Egypt, we find something more distinct and characteristic in the arrangement of the mosques. Some of these consist of a large open court-yard surrounded by arcades somewhat resembling our cloisters, but that the arcades are several rows deep instead of one, while on the side nearest Mecca these rows are further increased in number, so as to afford additional accommodation for praying in that direction. Such is the mosque of Amrou at Old Cairo, the plan of which is illustrated by Fergusson on page 388. Such also is that of Ebn Touloun, of which he gives a view on page 390, while Rosengarten gives, on page 201, a plan, section, and details of it. The section shows the cupola raised over the well that is usually provided for ablutions in the centre of the courtyard. Wooden tie-beams at the springing of the arches are a common feature in these mosques. The plan and section of the mosque and tombs of Sultan Barkook, on page 392 of Fergusson, introduce us to the Egyptian form of dome raised over these great sepulchral chambers "betraying the existence of a strong affinity to the tomb-building races in the rulers of Egypt at that time." The next example given by him is the Mosque of Hassan at Cairo, in which the courtyard is reduced to comparatively small dimensions, but has four gigantic niches opening out of it, almost like the nave, transept, and choir of a church, and, beyond the Kibleh, the huge tomb of the founder flanked by minarets, a very grand composition. He next mentions the Mosque El Moyed, erected in 1415 A.D. Smith & Slater give on page 259 an internal view of this mosque looking along the arcade nearest Mecca, and showing the Kibleh with its adjoining mimbar on the right side of the view, and thus explaining the liturgical arrangements very clearly. A mimbar may be seen at the South Kensington Museum. This also introduces us to the horse-shoe arch, a form which we shall find often repeated in Spain.

Lastly, Fergusson gives a plan, on p. 398, of the Great Mosque at Mecca, of which, of course, the principal object is the Kaabah, a small tower nearly but not quite square in plan, and the upper part covered with a black cloth, which is annually renewed. Next in importance to this is the Zemzem, or holy spring, which is said to have gushed out on this spot to the succour of Ishmael and his mother when perishing of thirst. Coste's "Architecture Arabe; ou, Monuments de Kaire," 1839., fol., illustrates this branch of the style.

Turning to Persia, no Saracenic building is to be found dating from the first six centuries of the Hegira. One of the earliest, says Fergusson, of which anything like correct illustrations have been published, is the Imaret or Hospital of Oulou Jami, at Erzeroum, a pointed arcade of two stories, surrounding on three sides a courtyard, the whole bearing some resemblance to a Christian Church. Tall arches facing the open air,—in fact, gigantic niches,—are characteristic of Persian Saracenic work, as are also the surface decorations of glazed bricks of the most brilliant colours, the Persians having always been remarkable for their excellence in polychromy. The form of arch affected by these people is slightly ogeed, or, more correctly speaking, resembles an arch which starts with the respectable intention of being a four-centred or straight-sided Tudor arch, and changes its mind at the apex by curving upwards. We now come also to the bulbous domes, such as that over the Madrissa, or College of Sultan Husein at Ispahan. Flandrin et Coste's "Voyage en Perse," 1850, 2 vols., 8vo., is a good work to study on this subject.

India was invaded by the Mahometans in 975 A.D., but Fergusson says, on p. 413, from sources different from those which introduced the religion into other countries, and resulting in a combination of Tartar and Hindu architecture. He illustrates the ruins in old Delhi, around the tall column of Victory, erected by Kootub. Many parts of this building are, more correctly speaking, Hindu work, but the central range of arches which he illustrates, on p. 419, are Saracenic, and they are mentioned here in order to refer the student to an enormous sgrafito representation of them in the India Museum at South Kensington. The Minars in India differ from what we have hitherto seen in having sloping sides, and in their peculiar form of plan. Bulbous domes are not uncommon, and we find a mushroom bed of them in some places, such as the mosque at Mandoo, which are suggestive of the native Indian examples alluded to in a former article.

Of course, we must bear in mind that, in following out this Saracenic style in various parts of the world we are, chronologically speaking, stepping far ahead of our Lombard and Early Rhenish friends, this mosque at Mandoo having been built between 1305 and 1432 A.D. The next example given by Fergusson,—the mosque at Ahmedabad,—is very interesting as re-introducing the old Jaina construction of slabs supported on columns; on page 430 he illustrates a comparatively modern example,—the Great Mosque at Delhi, built by Shah Jehan in 1628 A.D. "It explains all the parts by which a mosque of this age was usually characterised,—the western part with its lofty centre, three domes, and two minarets, and the courtyard with its open colonnades, its towers at the angles, and three gateways, the eastern one being always more splendid than those on the north and south." An elevation of this mosque, called the Jumna Mosque, is given by Rosengarten on page 224, and it differs somewhat from Fergusson's view, being taken through the courtyard.

There are many fine examples of Saracenic tombs in India, the most important and beautiful of which was built by the same Shah Jehan to contain the remains of his favourite wife, Moomtaza Mehal (see page 437 of Fergusson), and also a paper on the subject read at the Institute by Mr. Emerson in May, 1870. It is said that descriptions utterly fail to convey a true idea of this fairylike and yet most substantial building. It is covered by a bulbous dome, which, however, sinks into insignificance in point of size when compared with that built at Beejapore over the tomb of Mahomet, who reigned from 1626 to 1660; that is to say, a few years before our St. Paul's was built. This dome is 124 ft. in internal diameter, and the thrust is most ingeniously counteracted by an inner overhanging gallery.

The Eastern Saracenic architecture having been examined, Fergusson brings us westward to Spain, invaded by the Moors in 711 A.D., and this branch of the style, besides being near home, is interesting from its mixture with Western Christian art. The first important building that was commenced by the Moors is the mosque at Cordoba, 786 to 796 A.D. This portion, built by Abd el Rahman and his son Haschem, is not unlike the Aksah at Jerusalem, which the Caliph is said to have been anxious to surpass, and consists of eleven aisles divided by arcades, and facing a courtyard. This arrangement was supplemented by eight more aisles added by El Mansour, 976 to 1001 A.D., so that there is a very forest of columns. In the middle of all this the Christians built a cathedral, and erected altars in various directions. The entire plan is given in Mr. Carpenter's paper, read at the Institute, with the various dates indicated by different colours.

The Moorish architecture consists of a peculiar arrangement of columns supporting an upper range of columns, whose height is occupied by intersecting cusped arches, but which are themselves surmounted by horse-shoe arches. The cusped arches are in other cases also repeated above, so that a great degree of richness is obtained. It should be remarked that the pointed arch appears nowhere in these Moorish examples at an age when its employ-

ment was universal in the East, thus showing, according to Fergusson, "how completely the Saracenic architects followed the traditions of the country in which they found themselves. At Cordoba they never threw off the influence of the Roman arch, though further north the pointed arch is by no means uncommon. Giraud de Prangey's "Monuments Arabes et Moresques de Cordone, Seville, et Grenade," 1839, fol., is the work to consult on this subject. At Seville there was another example of a mosque converted into a Christian cathedral; but the chief Moorish object of interest is the tower called the Giralda (from its weathercock), which is justly world-renowned. The present top story is of Renaissance date, and will not be confused with the Saracenic style of the rest. Gwilt gives illustrations from Laborde's "Spain."

In Granada we come to another famous example, the Citadel and Palace of the Alhambra. Here we find the Moorish style carried to the very extreme of lightness and elegance. There is none of the cuspy confusion of Cordoba, while we get the wonderful intricacies of honeycombed arches and vaults which were, no doubt, a development of the system of pendentives common to most Saracenic styles, and here carried out to their fullest extent. The reproduction of the Court of Lions in the Alhambra at the Crystal Palace will give a very good notion of this marvellous building, with its gorgeous coloured decoration on floor, walls, and roof.

The last country that we have to consider is Turkey. Constantinople was not conquered by the Mahometans till 1453 A.D., who here, as usual, adopted and suited to their purpose the style of the country in which they located themselves, and this they did by going to the fountain-head, namely, to Sta. Sophia, and founding their buildings upon the great creation of Justinian. The Mosque of Soliman, 1550—1555 A.D., is avowedly a copy of this church, not only in plan and form, but also in size, as will be seen from the plan given by Fergusson on p. 466. This is, therefore, a very forcible instance of the history of this "cuckoo" style, as it may be called; for it not only invaded the nests of the Christians and others in various parts of the world, but calmly assimilated the food which had been prepared for their beaks. It has turned out to be a bird of fine plumage wherever it has settled, and we shall now recognise the colour of its feathers when we come across them in pursuing the thread of Christian architecture from the point at which we left it in the last article.

BUILDING PATENT RECORD.*

APPLICATIONS FOR LETTERS PATENT.

Aug. 8.—11,050, R. Schomburg, London, Iron Bars for Fireplaces.—11,054, J. Rickard, St. Columb Major, Corrugated Iron Roofing.—11,058, J. Jackson, London, Spring Clip to Fasten Stair and Curtain Rods.

Aug. 9.—11,096, S. Cowan, Dalbeattie, Grease Traps.—11,097, C. H. Ellis, Exeter, Consolidating Granular Substances into Bricks, Artificial Stone, &c.—11,108, F. Bosshardt, London, Asphalte Paving, &c. Com. by E. Dietrich, Berlin.—11,110, G. T. Cleaton, London, Bolts for Doors or Windows, &c. —11,113, J. Rosenthal and C. M. Rosenthal, Vienna, Fireproof Armoured Curtains for Theatres and Buildings. —11,116, D. Wilson, London, Construction of Fire Backs and Baskets of Portable Cooking Ranges.

Aug. 11.—11,125, J. Suter, J. Whittaker, and J. Sheldon, Manchester, Fans for Ventilating, &c.—11,135, S. H. Sharp, Halifax, Imitating Stained-Glass Windows.—11,151, J. Miller, London, Manufacture of Bricks from Slag or Scoriæ from Blast Furnaces.—11,155, S. P. Wilding, London, Mastic or Cement. Com. by J. Aubrey and Count G. de Vaussay, Paris.

Aug. 12.—11,173, T. Horton, Birmingham, Roller-Blind Furniture.—11,176, F. J. Kellow and J. C. Rodger, Southampton, Walls.—11,186, E. Burton, London, Storing Dust and House Refuse, &c.

Aug. 13.—11,224, H. A. Williams, Stratford, Fastening Window Sashes.—11,237, L. A. Groth, London, Warming Stove. Com. by G. Boretti, Ardenza.

Aug. 14.—11,251, T. Garforth and W. Garforth, Mirfield, Tieing Bricks or Stones together.—11,252, H. C. Board, Bristol, Heating Apparatus.—11,273, M. Underwood, Devonport, Double Dovetailing in Metal, Wood, Stone, &c., without Rivets.—11,276, W. Ayres, London, Weights for Cords of Sashes, &c.—11,289, W. H. Sleep, London, Sliding Sashes.

* Compiled by Hart & Co., Patent Agents, 186, Fleet-street.

SPECIFICATIONS ACCEPTED.*

Aug. 12.—799, E. H. Harling, London, Window Fasteners.—1,641, W. R. Lake, London, Grates and Grate-bars. Com. by L. Bannister, Philadelphia, U.S.A.—5,994, W. H. Bates, G. Bidlake, and H. Faulkner, Leicester, Door-mats, &c.—8,395, W. G. Cannon, London, Hot-water Coils for Heating Purposes.—9,246, F. W. Coons, London, Engraving Marble and Granite.—10,049, A. Besson, Paris, Stoves.

Aug. 15.—9,308, G. W. Chambers, Rotherham, Stove Grates.

ABRIDGMENTS OF SPECIFICATIONS

Published during the week ending August 16, 1884.

5,825, J. Shanks, Barrhead, Water-closets, &c. (Dec. 21, 1883, price 4d.)

The closet basin and trap are formed of earthenware, and in addition to the usual outlet at the bottom of the trap, another one is made on the outer side of the bend. In trough-closets the flushing-cistern is formed inside the closet, at one side thereof.

5,870, W. Ross, Glasgow, Automatic Drain-flushing Apparatus. (Dec. 27, '83, 6d.)

Inside the tank is a beam lever, on one end being an inverted cup-shaped sucker and valve fiittng over the outlet opening. The other end is weighted to over-balance the valve, and a spindle is connected thereto, on which is a sucker, above being a weight on a hollow spindle surrounding the central spindle, on which hollow spindle is a float-ball. The water is supplied to the tank at a certain determined speed, and the ball rises therewith, until it touches a bracket above, when a small spring valve is opened, by which air is admitted to the pan down the hollow spindle to the sucker, and as the vacuum is thereby destroyed the lever falls and the flush is effected.

5,940, J. C. Mewburn, London, Water-closets. Com. by J. E. Boyle and H. Huber, New York, U.S.A. (Dec. 31, '83, 6d.)

This is an improvement on Patent No. 889 of 1882 in making the descent of the flushing water create a vacuum in the top of the trap of the basin, thereby syphoning the bowl. This is effected by leading the air-pipe from the trap up through the flushing-tank, and covering it with a bell, from which the air is exhausted by the descent of the water, and a vacuum caused therein until the bottom of the bell is uncovered by the tank being emptied.

5,949, F. Walton, Twickenham, Manufacture of Wall Decoration in Ornamental Relief. (Dec. 31, '83, 6d.)

The relief ornament of such surfaces as "Lincrusta-Walton" is coloured by being passed between two rollers, very accurately adjusted, one of which is covered by rubber, and the colour is applied to this rubber, which only touches the elevated portions. Colour is also applied to the whole surface and then rubbed off the higher parts by this roller, when another colour is applied thereto as before.

* Open to public inspection for two months from the dates named.

Miscellanea.

Extensions at Herne Hill Railway Station.—In anticipation of increased traffic, and to meet present demands, the directors of the London, Chatham, and Dover Company are carrying out a very extensive enlargement of their important junction station at Herne Hill. The whole of the land belonging to the company on the east side of the station, which for several years past has been occupied as coal depôts, and which is upwards of 600 ft. in length, and about 80 ft. in width, is being absorbed into the station area. This land is considerably below the railway level, and the enlarged station area is carried on a series of arches,—twenty-five in number,—which will afford room for three additional lines of rails, and also provide space for a new central platform, upwards of 300 ft. in length. This platform will be reached by a flight of steps from a new underground approach on the east side. This approach is continued under the station area to the west side near the present booking offices, and the steps leading up to the existing central platform are being entirely reconstructed and much widened, whilst the platform itself has been considerably extended in length. Several new waiting-rooms and other offices are in course of erection. The line is carried over Half Moon-lane by two iron girder bridges upwards of 60 ft. in width. When the works now in progress are completed the station will be almost double its former area. The contractors for the works are Messrs. Ball & Gammon.

The Royal Cornwall Polytechnic Society. At the fifty-second annual exhibition of this Society at Falmouth last week, the first bronze medal was awarded to Mr. W. E. Hill, of Stokes Croft, Bristol, for architectural designs, this being the highest award in architecture. The drawings exhibited by Mr. Hill consisted of designs for artisans' dwellings, entrance lodges, and for cottages especially adapted for miners, the latter attracting a large amount of attention.

Ventilation of Coal Cargoes.—The committee of Lloyd's have received from the Board of Trade a report concerning the surface ventilation of the cargo of 2,050 tons of coal carried in the *Sutherlandshire*, from Hull to San Francisco, last year, from which it appears that advantages arise from the fitting of tubes for enabling the master to ascertain the temperature of the body of the cargo, as recommended by the report of the Royal Commission appointed to inquire into the spontaneous combustion of coal in ships. This ship has now again left Hull for San Francisco with soft coal as before, and with the same fittings. Her commander, Captain Inglis, highly approves of them, and will continue testing the temperature. It is stated that, while the *Sutherlandshire* was at San Francisco, three vessels arrived coal-laden on fire, and that one of them, an American ship, had been on fire fifty-three days. When detained, the *Sutherlandshire* was fitted with a box ventilator on each hatch, viz., fore, main, and aft, passing down through the body of the coals. There was also one 14-in. iron cowl ventilator passing through the forecastle and main decks, one trunk ventilator with skylight top leading through midship house and main deck, one 18-in. iron cowl abaft mainmast leading to the water tanks, and two 12-in. cowls through poop and main decks to store-room right aft. The alterations made were as follow:—The two aft ventilators were boxed, and continued through the store-room deck to the cargo. The tank ventilator was opened out to the cargo at the main deck, and the trunk and forecastle ventilators were accepted (being suitable for surface ventilation). The three wood box ventilators in the hatchways were removed, and testing pipes put in their places. A record was kept of the temperature of the cargo, and the figures may be seen at Lloyd's, in the secretary's office.—*Iron.*

Improved Ambulance Vans.—With the view of avoiding risk of contagion in the conveyance of patients suffering from small-pox or contagious fevers to hospitals, Dr. Gayton, senior medical officer of the Metropolitan Asylums Board, has constructed an ambulance van of new and improved form. Instead of having open glass and wooden louvre shutters, its apertures consist of a double layer of perforated metal, inclosing an absorbent material saturated with an acknowledged germicide or destroyer of the minute microscopical particles which tend to propagate disease. Fresh air is admitted through modified and improved "Tobin" ventilators of a horn-shape, with the larger end opening externally, whilst inside the van the smaller extremity of this air-tube is provided with a disinfecting air-chamber, constructed like those attached to the other apertures or windows. The Metropolitan Asylums Board use these ambulances for conveying small-pox convalescents from Hampstead to their river wharf, *en route* to the hospital ships off Purfleet.—*Daily Telegraph.*

Liverpool and the Manchester Ship Canal.—At the meeting of the Liverpool City Council on Wednesday, Sir William B. Forwood referred to the Manchester Ship Canal Scheme, and said the total expense of the Corporation in opposing it in Parliament was about 8,000*l.* The defeat of the Bill had saved the estuary of the Mersey, and averted a great calamity from Lancashire. He urged Manchester to abandon the scheme for a ship canal, and to go instead for a barge canal for vessels up to 600 tons. He recommended the purchase and deepening of the present Bridgwater Canal. Sir William then referred in strong terms to the excessive charges levied by the railway companies for carriages fgoods between Liverpool and Manchester. This was the real cause of all the dissatisfaction that existed. He asserted that the railway companies could afford to reduce the charges 30 per cent. without taking a penny from the pockets of the shareholders. He urged co-operation between Liverpool and Manchester to upset the railway combination and monopoly.

Civil and Mechanical Engineers' Society. The members of this Society had a most enjoyable excursion on the 14th instant to the East and West India Company's new docks at Tilbury. The party were conducted over the docks by the resident engineer, Mr. Donald Baynes. After these works had been inspected the party proceeded to the Clarendon Hotel for luncheon, and afterwards by special boat to Thames Haven to inspect the petroleum stores, over which they were conducted by the engineer, Mr. Wm. C. Street.

Sanitary Institute of Great Britain.—The Autumn Congress is arranged to be held at Dublin, from September 30th to October 4th, 1884, and an Exhibition of Sanitary Apparatus and Appliances in connexion with the Congress will be held in the Royal Dublin Society's Buildings, Balls Bridge, from September 30th to October 18th. Sir Robert Rawlinson, C.B., will be the President of the Congress, which will include three sections, viz., I.—"Sanitary Science and Preventive Medicine," presided over by Dr. Thomas W. Grimshaw, Registrar-General for Ireland. II.—"Engineering and Architecture," presided over by Mr. Charles D. Cotton, C.E. III.—"Chemistry, Meteorology, and Geology," presided over by Dr. Charles A. Cameron, Superintendent Medical Officer of Health for Dublin.

Proposed Art and Sanitary Exhibition at Eastbourne.—We have received the programme of the "Eastbourne Arts, Science, and Sanitary Association and Exhibition of Fine Arts," [comprising "new decorative fine art for modern dwellings, tapestry, paperhangings, lace, furniture, clocks, improved scientific instruments, pottery, china, terra-cotta and glass, silver and electro goods, English and foreign carvings and paintings, metal-work, musical instruments, photography, electric lighting, and kindred inventions." The exhibition is to be held in the Devonshire Park Pavilion, commencing 4th September, and to continue to the 13th, inclusive. The object of this Exhibition is to advance decorative art in modern dwellings, and to popularise recent scientific improvements.

Enlargement of the Dulwich Picture Gallery.—The picture gallery attached to the old College at Dulwich is at present undergoing enlargement by the conversion of the south wing of the gallery buildings, which has hitherto been occupied as the Women's Almshouses. The added exhibition-room will be 19 ft. by 28 ft., and 25 ft. in height, with a lantern light in the centre. The works are being carried out from the designs of Mr. Charles Barry, architect to the College estate. The contractors are Messrs. J. & C. Bowyer, of Upper Norwood.

Public Works at Newcastle-on-Tyne.—The Prince and Princess of Wales visited Newcastle-upon-Tyne on Wednesday, and opened an addition to the public park, where the Princess planted a tree, and they afterwards opened the new Natural History Museum and a Free Library. On Thursday they opened the new Coble Dene Dock.

TENDERS.

For the erection of the Paragon Theatre of Varieties, Mile End-road, for Messrs. Crowder & Payne. Mr. Frank Matcham, architect, Rugby-chambers, Bedford-row, W.C. Quantities supplied by Mr. Frederick Thomson, 20, York-buildings, Adelphi:—

		A.*
Kirk & Randall	£22,680 0 0	£227 0 0
Perry & Co.	22,320 0 0	280 0 0
Wall Bros.	22,171 0 0	300 0 0
Toms	22,000 0 0	297 0 0
Patman & Fotheringham	20,150 0 0	270 0 0
Wm. Brass	20,140 0 0	265 0 0
McCormick & Sons	19,987 0 0	250 0 0
Dove Bros.	19,954 0 0	255 0 0
Morter	19,940 0 0	265 0 0
Shurmur	19,782 0 0	252 0 0
Roach	18,760 0 0	400 0 0
Lusk	16,600 0 0	280 0 0
F. & F. J. Wood	15,983 0 0	430 0 0
Jackson & Todd	14,995 0 0	277 0 0

* Reduction if zinc be used in lieu of lead.

For additions, Royal Masonic Institution for Boys, Wood Green. Messrs. Hovenden, Heath, & Berridge, architects:—

King & Son	£13,335 0 0
Ashby & Horner	13,224 0 0
Humphreys & Son	13,150 0 0
Patrick & Son	12,950 0 0
Bangs & Co.	12,934 0 0
Grimwood & Sons	12,899 0 0
W. & T. Denne	12,811 0 0
Lawrence & Sons	12,793 0 0
Ashby Bros.	12,777 0 0
Peto Bros.	12,678 0 0
Perry & Co.	12,604 0 0
Martin, Wells, & Co.	12,510 0 0
E. Conder	12,327 0 0
Fish, Prestige, & Co. (accepted)	12,312 0 0

For the repairing of Westbere Church, near Canterbury, for the rector and churchwardens. Mr. E. P. Loftus Brock, F.S.A., architect:—

J. E. Wiltshier, Canterbury	£715 0 0
H. Stiff, Dover	710 0 0
W. J. Adcock, Dover	673 0 0
H. B. Wilson, Canterbury	652 0 0

For alterations and additions to stables, Aubert Park, Highbury. Mr. Chas. Bell, architect. Quantities by Mr. H. Lovegrove:—

Chas. Warr	£830 0 0
John Anley	745 0 0
George Green	730 0 0
J. Allen & Sons (accepted)	618 0 0

For the erection of a villa residence on the Mersea-road (Meyrick-crescent), for Mr. J. E. Roff. Mr. J. W. Start, architect, Head-street, Colchester. Quantities supplied:—

G. Bowles	£525 0 0
E. Eade	525 0 0
H. Ambrose	517 2 9
A. Diss	498 0 0
C. Shepherd	470 0 0
A. Chambers	465 0 0
F. Dupont	456 0 0
C. H. Oldridge (accepted)	427 0 0

[All of Colchester.]

For alterations at the Falcon public-house, Bedford-road, Clapham, for Mr. H. Nobes. Mr. H. I. Newton, architect, 17, Queen Anne's Gate:—

Lamble	£479 0 0
Royal	470 0 0
Burman & Sons	430 6 0
Pack Bros.	428 0 0
Cook Bros (accepted)	369 0 0

For new concrete gas-holder tank at Wellingborough:—

J. Jevons, Dudley	£2,351 13 0
F. C. Bugbird, Enfield	2,308 8 0
W. J. Botterill, London	2,098 0 0
E. Brown, Wellingborough	2,125 0 0
F. Barlow, Rothwell	1,725 0 0
G. Henson, Wellingborough	1,589 0 0
B. Cook & Co., London	1,540 0 0
C. J. Corrie, Lichfield (accepted)	1,500 0 0

For new town-hall, additions and alterations to market, &c., at Wellington, Somerset, for the Wellington Town-hall and Market Company, Limited. Mr. E. T. Howard, architect, Wellington:—

J. Morse	£2,768 10 0
Grates & Pyle	2,745 0 0
Stephens & Bastow	2,500 0 0
Chas. Fox	2,450 0 0
Dinham & Verrier	2,380 0 0
H. J. Spiller	2,235 0 0
A. Poole, Ilminster, (accepted)	2,045 0 0

For three cottages at Wellington, Somerset, for the Misses Elworthy. Mr. E. T. Howard, architect:—

Templeman	£500 0 0
Morse	374 10 0
Twyford, Wellington (accepted)	345 0 0

For alterations to Backways Farm, Wellington, Somerset, for Mr. W. Searle. Mr. E. T. Howard, architect:—

Jones	£167 0 0
Follett	147 0 0
Morse	139 10 0
Chanter & Brook, Crediton, Devon (accepted)	108 14 0

For additions to Board Schools, Wellington, Somerset, for the Wellington School Board. Mr. E. T. Howard, architect:—

J. Morse, Taunton (accepted)	£176 10 0

For the erection of a new wing to Manresa House, Roehampton, Surrey. Mr. Frederick A. Walters, architect, 4, Great Queen-street, Westminster. Quantities supplied by Mr. W. H. Brayshaw:—

Boyce	£5,473 0 0
Carless	5,463 0 0
Parmenter	5,460 0 0
Shaw	5,452 0 0
Sanders	4,980 0 0

For alterations and additions to Wesleyan chapel, Irchester, Northants. Mr. Arthur Wells, architect:—

Abbott, Little Harrowden	£318 0 0
Underwood, Wellingborough	275 0 0
West, Irchester	270 0 0
Hardwick, Irchester (accepted)	259 0 0

For the erection of school buildings at Stoughton, for the Guildford School Board. Messrs. Welman & Street, architects:—

G. Stallard, Havant	£4,500 0 0
C. Claridge, Banbury	4,252 0 0
H. Banham, Stoughton	4,250 17 10
G. & R. Smith, Guildford	4,140 0 0
Stephens & Bastow, Bristol	4,100 0 0
Harris & Son, Woking	3,918 0 0
Martin, Wells, & Co., Aldershot	3,900 0 0
Aldridge & Jenvey, Camberwell	3,854 0 0
Bull, Sons, & Co., Southampton	3,847 0 0
W. G. Butt, Woking	3,816 17 0
Mower, Hackney	3,799 10 0
T. H. Kingerlee, Oxford	3,790 0 0
H. Ingram, Woking	3,773 0 0
W. Holt, Croydon	3,720 0 0
W. Tribe, Stoughton	3,717 0 0
S. Woods, Weybridge	3,630 0 0
J. Botterill, Reading	3,629 0 0
Peter Peters, Horsham	3,516 0 0
J. Woolgar, Horsham	3,496 0 0
Redford & Potter, Horsham	3,162 0 0

For shop and warehouse, Nos. 199 and 201, Lewisham High-road, for Mr. G. E. Haycraft. Messrs. Romaine-Walker & Tanner, architects. Quantities by Mr. D. J. Brown:—

G. Hall	£3,049 0 0
Burman & Son	2,667 0 0
H. L. Holloway	2,560 0 0
A. & F. Smith	2,535 0 0
S. J. Jerrard	2,490 0 0
M. Redman	2,197 0 0

For enlargement of George-street Chapel, Bromley-by-Bow. Mr. R. H. Hill, architect, 8, Clement's-lane, Lombard-street:—

J. Holland	£993 0 0
Morter	921 0 0
Perry & Co.	914 0 0
Bangs & Co.	896 0 0
Gregar	895 0 0
Harris & Wardrop	884 0 0
Jolly & Sons	844 0 0
Allen & Sons	790 0 0

For making and draining, with sewer and surface-water drains, certain roads on the Crouch Hall Estate, Crouch End, for the Imperial Property Investment Company, Limited. Mr. G. H. L. Stephenson, surveyor, 57, Moorgate-street:—

McKenzie & Co.	£6,505 0 0
Cook & Co.	6,400 0 0
T. Adams	6,149 0 0
T. G. Dunmore	5,999 0 0
A. Walker	5,587 0 0
E. Wilson (accepted)	5,498 0 0

For pulling down and rebuilding Nos. 36 and 37, Chalk Farm-road, for Mr. G. P. Thompson. Messrs. Alexander & Gibson, architects, 9, Great James-street. Quantities supplied by Mr. H. Burton:—

Gould & Brand	£4,578 0 0
Priestley & Gurney	4,499 0 0
Green	4,257 0 0
Patman & Fotheringham	4,255 0 0
Smith	4,237 0 0
Beale (accepted)	3,870 0 0

For alterations and improvements at 69, Folkestone-road, Dover. Mr. Arthur Wells, architect, 27, Chancery-lane, London:—

Lewis (accepted)	£147 10 0

[No competition.]

Hot-water Apparatus.

M. Pepper	26 0 0

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
New School	Redruth School Board	25*l.*	Sept. 13th	ii.
Laying-out Plot of Land in Cheetham	Corporatn of Manchester	20*l.*, 5*l.*	Sept. 15th	ii.
Municipal Hall and Offices, Bombay	Municipal Commissnrs.	Rs. 5,000, 3,000, 2,000	Nov. 6th	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
County School at Doulting	Hugh Sexey's Hospital	G. J. Skipper	August 30th	ii.
Wrought-Iron Roofs	Huddersfield Corportn	*Official*	do.	ii.
Re-paving Wellington-st. with Cemnt Concrte	Aldershot Local Board	W. L. Coulson	Sept. 1st	ii.
Engine-house and Coal Store, &c., at Patcham	Brighton Corporation	E. Easton & Co.	do.	ii.
Sinking a Well at Patcham	do.	do.	do.	ii.
Making Roads	Wandsworth B. of Wks.	*Official*	Sept. 2nd	ii.
Sewerage Works, &c.	Westminster B. of Wks.	do.	Sept. 3rd	ii.
School Buildings	Guildford School Bd.	Wm. G. Lower	do.	ii.
Pipe-Sewers, &c.	Claines Local Board	A. H. Parker	Sept. 4th	ii.
Schools, and Master's Residence	Stanwix School Board	C. J. Ferguson	Sept. 5th	ii.
Brick, Stoneware, and Cast-Iron Sewers	Stroud R. S. A.	J. P. Lofthouse	Sept. 8th	ii.
Reservoir, &c.	Stratford-on-Avon T. C.	Ed. Pritchard	Sept. 9th	ii.
Sewerage Works at Presteigne	Knighton Un. R. S. A.	Chas. Slagg	Sept. 15th	xxvii.
Cooking Apparatus, Kitchen and Bakery Fittings, &c.	Corporation of Exeter	R. Stark Wilkinson	Sept. 25th	xxvii.
Re-building of superstructure & strengthening of Hammersmith Bridge	Met. Board of Works	*Official*	October 2nd	ii.
Laying Pipe-Sewer, and forming Road at Penge	Not stated	W. Adams Murphy	Not stated	ii.
Roads and Paths, South Streatham Estate	do.	Wheeler & Hollands	do.	xxvii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Applications to be in.	Salary.	Page.
Assistant to Surveyor's Office of Works	Civil Service Com.	Sept. 5th	Not stated	xvi.
Clerk of Works	Willesden Local Board	Not stated	3*l.* 10s. per week	xvi.

For Fire Brigade Station, Bishopsgate-street, E.C., for the Metropolitan Board of Works. Mr. Geo. Vulliamy, architect:—

Porter	£17,751	0	0
Webster	16,098	0	0
Richardson	15,300	0	0
W. Shurmur	14,940	0	0
Wood	14,434	0	0
Hobbs	14,199	0	0
Holliday & Greenwood	14,177	0	0
Stephens & Bastow	14,000	0	0
E. C. Howell & Son	13,967	0	0
Garrud & Tinks	13,943	0	0
Oldrey	13,600	0	0
Reading	13,510	0	0
Hook	13,504	0	0
Mowlem & Co.	13,500	0	0
J. & J. Greenwood	13,278	0	0
Stimpson & Co. (accepted)	13,210	0	0

For new Wesleyan chapel, Herne Bay. Mr. Charles Bell, architect. Quantities by Mr. H. Lovegrove:—

T. W. Hickinbotham	£4,260	0	0
T. Cornelius	4,124	0	0
G. T. Adams	4,097	0	0
J. Smith & Sons	4,060	0	0
H. Brown	4,000	0	0
L. Shrubsole	3,993	0	0
Amos & Ford	3,923	0	0
C. W. Welby	3,895	0	0
H. Hill	3,885	0	0
W. Cozens	3,796	0	0
J. Holloway	3,773	0	0
W. A. Grubb	3,750	0	0
G. H. Denne & Son	3,700	0	0
J. Allen & Son	3,585	0	0

For alterations at the Rising Sun public-house, Deptford, for Mr. J. W. Dibbs. Mr. Henry Roberts, architect:—

Taylor	£668	0	0
Hubble & Trot	663	0	0
Holloway	649	0	0
Mower	642	0	0
Meager	407	0	0
Leng	393	0	0
Painting and Gasfitting.			
Ruse	111	0	0
Banks (accepted)	109	0	0

For alterations to the White Hart Tavern, King's-road, Chelsea, for Mr. J. J. Pope. Mr. Miller, architect. Quantities supplied:—

				F.*		
Speake	£560	0	0	£587	0	0
Mark	444	0	0	472	0	0
Adams	413	0	0	437	0	0
Pack	442	0	0	431	0	0
Kirk	337	0	0	417	0	0
Ansell	365	0	0	390	0	0
King	336	0	0	359	0	0

* Including new floors.

For various works at the Church of St. Mary, Spital-square. Mr. D. R. Dale, architect:—

Wontner Smith	£579	0	0
Brady	518	0	0
Pritchard	500	0	0
Kiddle	455	0	0
Hoare & Sons	434	0	0

For the erection of thirty-five cottages on the Shacklewell Estate. Mr. D. R. Dale, architect:—
G. Dale, Thornton Heath (accepted) £7,525 0 0

For detached villa on the First Portion of Stone Hall Estate, Oxted, Surrey. Mr. D. R. Dale, architect:—
G. Dale, Thornton-heath (accepted) £2,200 0 0

For rebuilding warehouse, Charterhouse-square. Mr. G. Perry, architect:—
W. Shurmur (accepted) £522 0 0

For alterations, &c, at the Cripplegate Bank, Whitecross-street, E.C. Messrs. Woodthorpe & Hammond, architects:—

G. Green	£814	0	0
W. Shurmur	693	0	0
J. W. Heeps	640	0	0
W. G. Larke	614	0	0

For alterations, &c., to the George and Dragon public-house, Hackney-road. Messrs. Bird & Walters, architects:—

G. Mower	£225	10	0
W. Shurmur	222	0	0
Jackson & Todd	220	0	0
J. Anley	215	0	0

For alterations, &c., at St. Andrew's Church, Bethnal-green. Messrs. Dollman & Allen, architects:—

B. E. Nightingale	£1,160	0	0
W. Shurmur	1,152	0	0

For extension of sewers, Brentford Drainage, Contract No. 5. Messrs. Gotto & Beesley, engineers; Mr. F. W. Lacey, surveyor:—

Cardus & Prowse	£1,970	0	0
Mears	1,695	0	0
Bottoms Bros.	1,684	0	0
Trueman	1,649	0	0
B. Cooke & Co.	1,580	0	0
Nicholls	1,377	0	0
Brunton	1,336	0	0
Owen & Brown	1,331	0	0
Everett	1,315	0	0
Watt & Lovedale	1,288	0	0
G. Bell	1,272	0	0
Catley	1,225	0	0
W. Williams, Wimbledon (accepted)	1,162	0	0

[Engineers' estimate, £1,350.]

For alterations at the Lord Lyndhurst public-house, Lyndhurst-road, Peckham, for Mr. Burney. Mr. Henry Roberts, architect:—

Sly	£737	0	0
Taylor	733	0	0
Holloway	719	0	0
Hubble & Trott	690	0	0
Meager	672	0	0
Mower (accepted)	626	0	0
Pewterer's Work.			
Banks (accepted)	54	10	0
Gasfitter's Work.			
Winn	142	0	0
Vaughan & Brown	138	0	0
Banks	134	0	0
Ruse	126	0	0

For a pair of semi-detached houses and boundary-walling at Marple, for Mr. John Crompton and Mr. Joseph Kirby. Mr. James Hunt, architect, Stockport. Quantities by the architect:—

Excavating and Draining.						
J. Kellett, Marp'e (accepted)	£30	19	9			
	Houses.			Walling.		
E. Simpson, Hyde	£1,231	0	0	£67	0	9
J. Bowden, Marple	1,180	0	0	72	10	0
Froggatt & Briggs, Stockport	1,096	0	0	99	0	0
S. Robinson, Hyde*	1,060	0	0	73	0	0

* Accepted.

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Received.—J. N.—A. P.—A. M.—A. T.—Y. & H.—B. & Cie.—J. C.—B & H.—C. R. A.—D. T. N.—W. J. M.—J. W. G.—H. & Co.—R. A. B.—F. & G. H.—C. J. R.—T. K. G. & S.—J. M.—J. D. W.—T. H. W.—W. G. S.—A. Ratepayer.—C. F. M.—F. P.—J. E. K. C.—H. M.—E. C.—G. H. B.—W. P.—W. W. L.—J. P. (we will ascertain if possible).

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Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

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